NOAA Technical Memorandum NMFS-SEFC-26

NOAA/NMFS FINAL REPORT TO DOE

Biological/Chemical Survey of Texoma and Capline Sector Salt Dome Brine Disposal Sites Off Louisiana, 1978-1979

A report to the Department of Energy on work conducted under provisions of Interagency Agreement EL-78-I-0-7146 during 1978-1979.

Volume II

ZOOPLANKTON

NOVEMBER 1980

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southeast Fisheries Center
Galveston Laboratory
Galveston, Texas 77550

NOAA Technical Memorandum NMFS-SEFC- 26

Biological/Chemical Survey of Texoma and Capline Sector Salt Dome Brine Disposal Sites Off Louisiana, 1978-1979

VOL. II - DETERMINE SEASONAL ABUNDANCE, DISTRIBUTION AND COMPOSITION OF ZOOPLANKTON

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LGL Ecological Research Associates, Inc.

F. J. Margraf, Ph.D.

INTRODUCTION

In compliance with the Energy Policy and Conservation Act of 1975, Title 1, Part B (Public Law 94-163), the Department of Energy (DOE) implemented the Strategic Petroleum Reserve (SPR). The SPR program was implemented in August of 1977 with the goal of storing a minimum of one billion barrels of crude oil by December 22, 1982. After evaluating several physical storage possibilities, DOE determined that storage in commercially developed salt dome cavities through solution-mining processes was the most economically and environmentally advantageous option.

Six areas along the northwestern Gulf of Mexico were to be investigated as potential storage cavern sites. These areas are shown in Figure 1. This project, "Biological/Chemical Survey of Texoma and Capline Sector Salt Dome Brine Disposal Sites Off Louisiana", deals with proposed disposal sites associated with two of the cavern sites, West Hackberry and Weeks Island. The Biological/ Chemical Survey was initiated in April 1978 and was completed in December 1979. Its major products are Final Reports available through the National Technical Information Service (NTIS), Springfield, Virginia; data files available through the Environmental Data and Information Service (EDIS), Washington, D.C., and any research papers that may be written by participating principal investigators and published in scientific or technical journals. Preliminary results were also made available through DOE/NOAA/NMFS project reviews and workshops attended by project participants and various governmental, private and public user groups.

The objectives of the Biological/Chemical Survey were: (1) to describe the biological, physical and chemical components of the marine ecosystem for each disposal site; and (2) to assess, by analysis of Gulf Coast shrimp data, the importance of the Louisiana shrimping grounds in the vicinity of the proposed salt dome brine disposal sites. These objectives were achieved using historical and new data to describe and quantify the biological, chemical, and physical characteristics and the temporal variations of these characteristics in the environments of each proposed disposal site.

The two proposed disposal sites have been extensively examined, using available meteorological, oceanographic, bathymetric and ecological data, in the following two reports:

Environmental Data Service, DOC/NOAA. 1977.

Analysis of Brine Disposal in the Gulf of Mexico, #2 West Hackberry. Report to Federal Energy Administration Strategic Petroleum Reserve Program Salt Dome Storage. Center for Experiment Design and Data Analysis, NOAA, EDS, Marine Assessment Division, Washington, D.C.

Environmental Data Service, DOC/NOAA. 1977.

Analysis of Brine Disposal in the Gulf of Mexico, #3 Capline Sector. Report to Federal Energy Administration Strategic Petroleum Reserve Program Salt Dome Storage. Center for Experiment Design and Data Analysis, NOAA, EDS, Marine Assessment Division, Washington, D.C.

The above reports and other pertinent documents are available from the Department of Commerce, National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia, 22151.

Proposed locations of the West Hackberry (Texoma Sector) and Weeks Island (Capline Sector) brine disposal sites are shown in Figures 2 and 3, respectively. These sites are subject to change within the same geographic area pending results of baseline surveys presently underway.

The proposed West Hackberry disposal site is located approximately 9.7 km (6 miles) south off the coast from Mud Lake at Latitude $29^{\circ}40'$ N and Longitude $93^{\circ}28'$ W at a bottom depth of about 9 m (30 feet). Operational requirements and engineering limitations of the proposed brine diffuser at this site are as follows: length - 933.3 m (3070 feet); orientation -normal to coast; number of ports - 52; length between ports - 18 m (59 feet); port diameter - 7.6 cm (3 inches); orientation of port riser - 90° to bottom; and port exit velocity - 7.6 m/sec (25 ft/sec).

The proposed Weeks Island (Capline Sector) disposal site is located approximately 41.8 km (26 miles) off Marsh Island at Latitude 29 04'N and Longitude $91^{\circ}45'$ W at a bottom depth of about 9 m (30 feet). Operational requirements and engineering limitations of the proposed brine diffuser at this site are as follows: length - 608 m (2000 feet); orientation -normal to coast; number of ports - 34; orientation to port riser - 90° to bottom, and port exit velocity - 7.6 m/sec (25 ft/sec).

The Biological/Chemical Surveys in the proposed salt dome brine disposal sites described seasonal abundance, distribution and community composition of major benthic, planktonic, bacterial and demersal finfish and macro-crustacean ecosystem components; the sediments; the hydrocarbons and trace metals composition and concentration in the marine ecosystem; and the seasonal variations in inorganic nutrients composition and concentration of the water column. The sampling scheme used for sample collections around the two sites is shown in Figure 4. A separate data analysis assessed the importance of shrimping grounds in the vicinity of the proposed brine disposal sites in terms of historical data on species composition, marketing size categories and location of commercial shrimp catches within statistical reporting zones off the Louisiana coast.

Information concerning data from this project is available through the Program Data Manager: Mr. Jack Foreman, Environmental Data and Information Service, Page Building No. 2, 3300 Whitehaven Street, N.W., Washington, D.C.

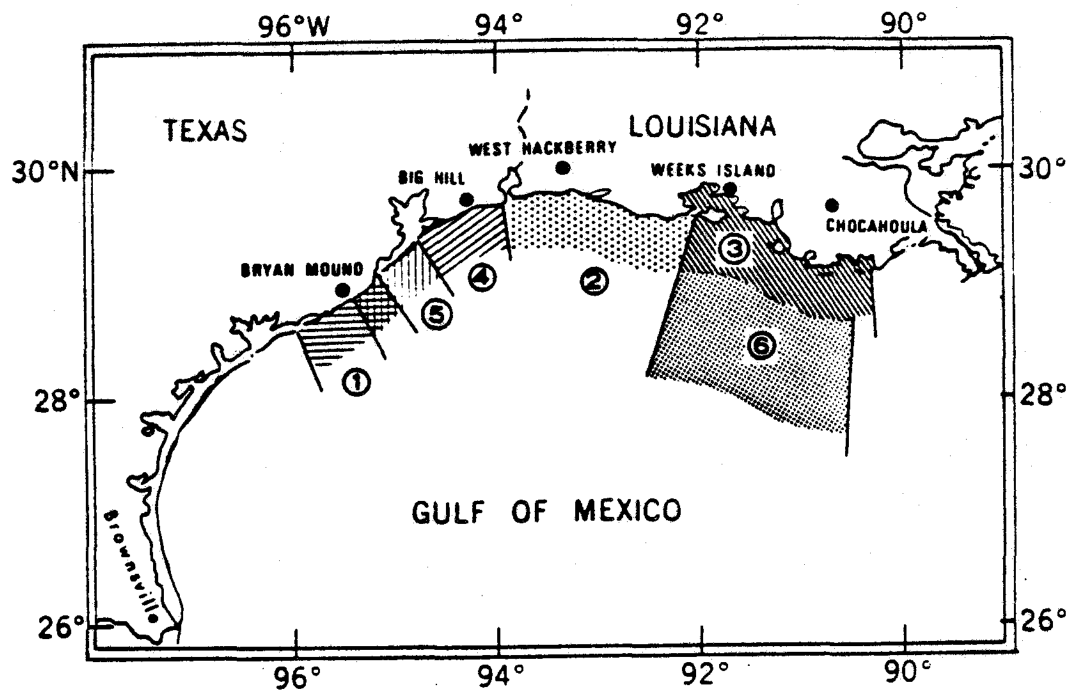

Figure 1. Regions of Study for Brine Disposal Assessment-DOE/NOAA Interagency Agreement (adapted from Environmental Data Service, DOC/NOAA. Analysis of Brine Disposal in the Gulf of Mexico, #2 West Hackberry. 1977.).

1 Texas Coastal Ocean, Colorado River to San Luis Pass (Bryan Mound)

2 Louisiana Coastal Ocean, Sabine Lake to S.W. Pass of Vermilion Bay (West Hackberry)

3 Louisiana Coastal Ocean, S.W. Pass, Vermilion Bay to Timbalier Island (Capline Sector)

4 Texas Coastal Ocean, Port Bolivar to Sabine Pass

5 Texas Coastal Ocean, Freeport Harbor to Galveston South Jetty

6 Louisiana Coastal Ocean, Offshore from Vermilion Bay to Terrebone Bay

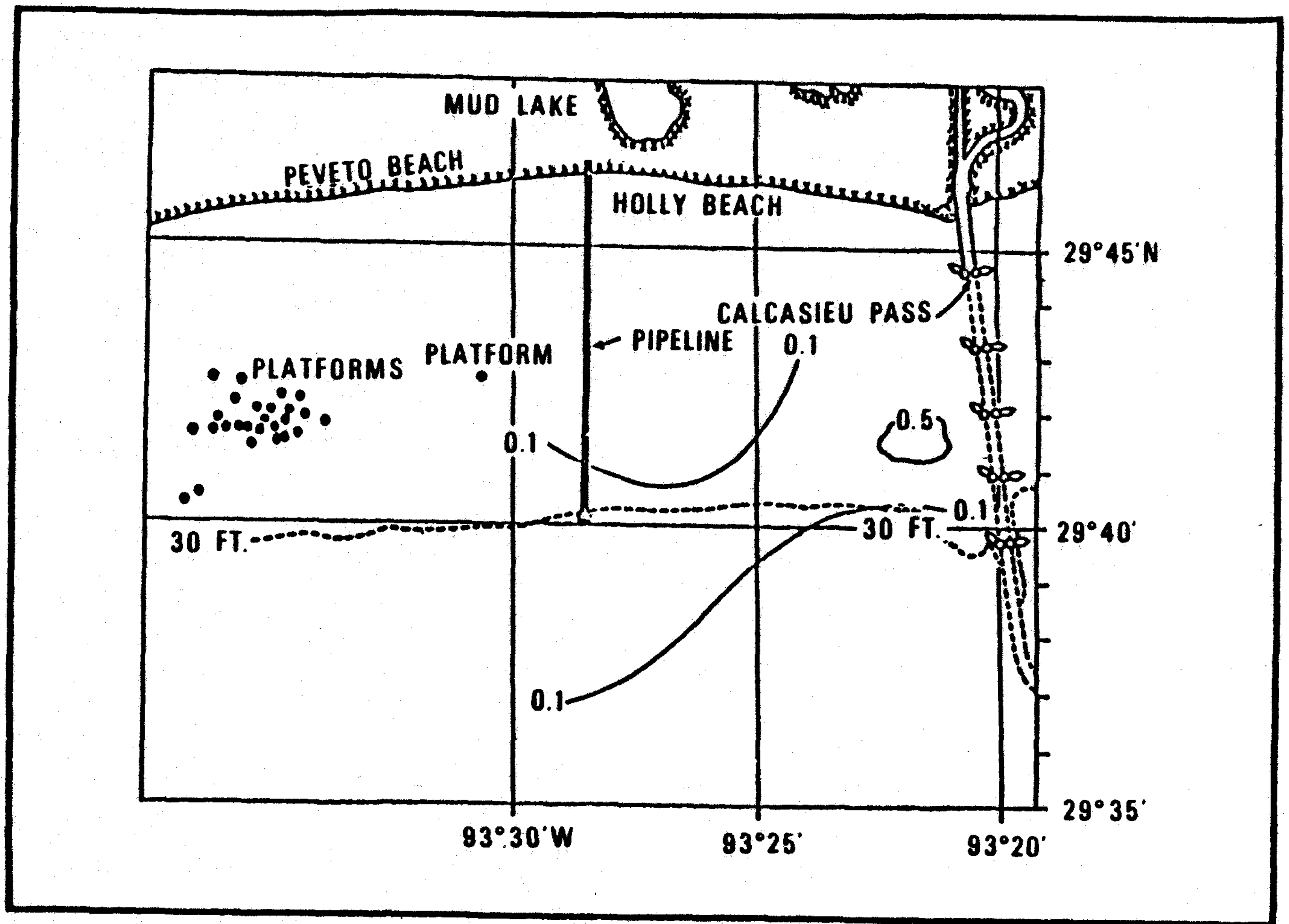

Figure 2. Proposed Texoma brine disposal site.

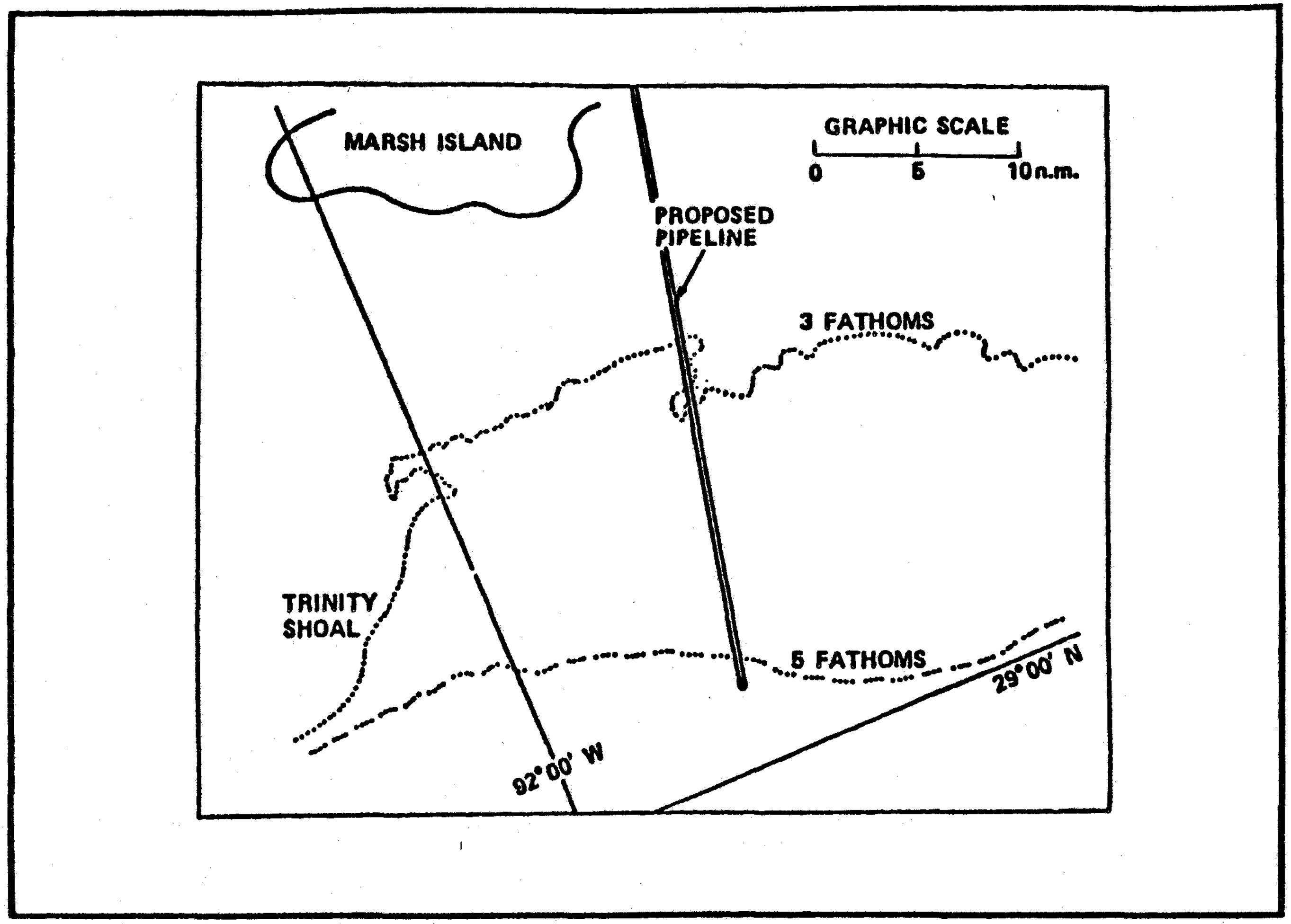

Figure 3. Proposed Capline brine disposal site.

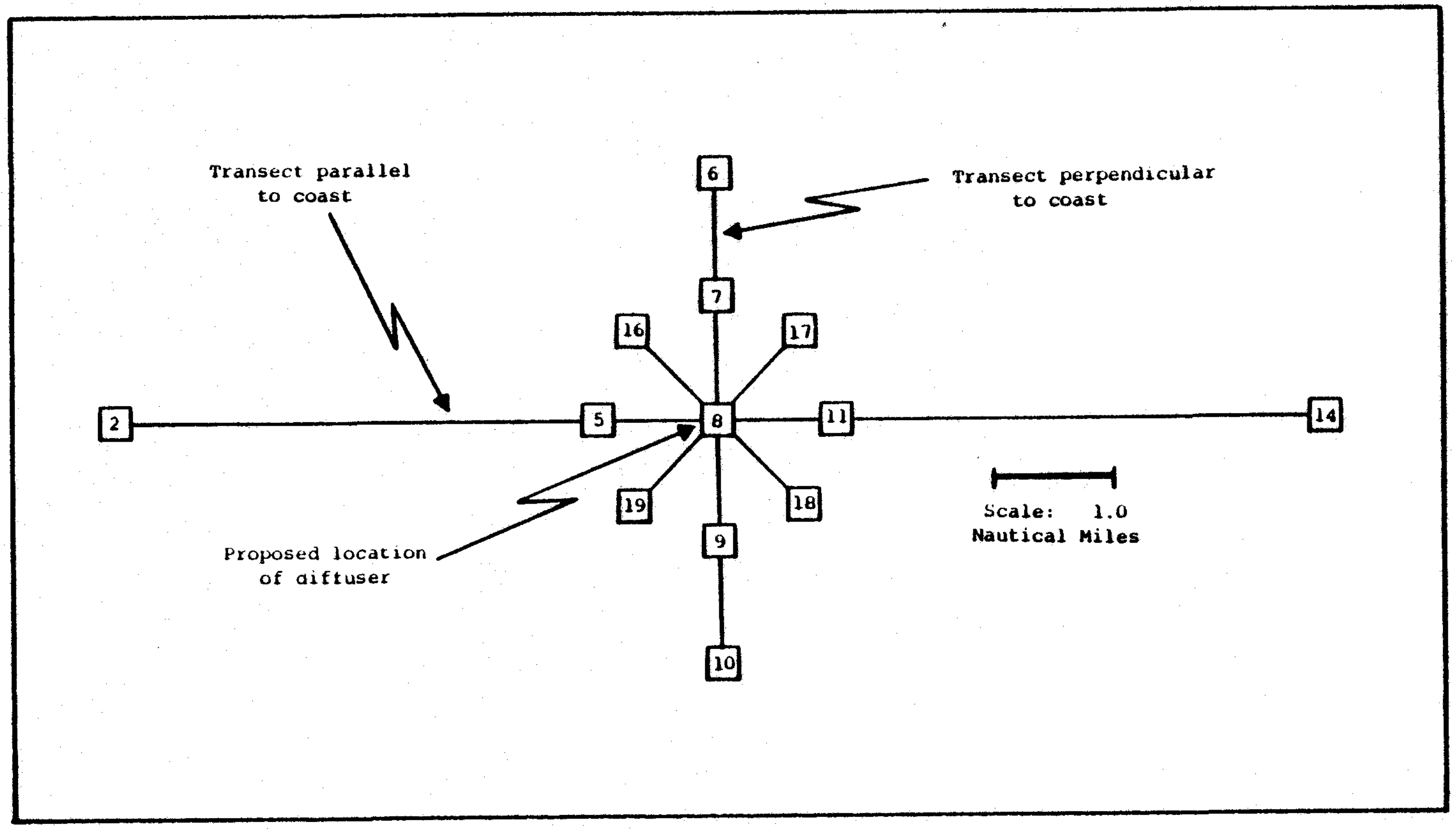

Figure 4. Sampling scheme for proposed salt dome brine disposal sites.

REPORTS AND PUBLICATIONS

Boehm, P. D. and D. L. Fiest. 1980. Determine hydrocarbons composition and concentration in major components of the marine ecosystem. Vol. VI. In: Jackson, W. B. and G. M. Faw (eds.). Biological/chemical survey of Texoma and Capline sector salt dome brine disposal sites off Louisiana, 1978-1979. NOAA Technical Memorandum NMFS-SEFC-30, 136 p. Available from: NTIS, Springfield, Virginia.

Brooks, J. M. 1980. Determine seasonal variations in inorganic nutrient composition and concentration of the water column. Vol. VIII. In: Jackson, W. B. and G. M. Faw (eds.). Biological/chemical survey of Texoma and Capline sector salt dome brine disposal sites off Louisiana, 1978-1979. NOAA Technical Memorandum NMFS-SEFC-32, 31 p. Available from: NTIS, Springfield, Virginia.

Caillouet, C. W., F. J. Patella and W. B. Jackson. 1979. Relationship between marketing category (count) composition and ex-vessel value of reported annual catches of shrimp in the eastern Gulf of Mexico. Marine Fisheries Review 41(5-6):1-7.

Caillouet, C. W., F. J. Patella and W. B. Jackson. 1980. Trends toward decreasing size of brown shrimp, *Penaeus aztecus*, and white shrimp, *Penaeus setiferus*, in reported annual catches from Texas and Louisiana. NOAA/NMFS Fishery Bulletin 77(4):985-989.

Caillouet, C. W., D. B. Koi and W. B. Jackson. In press. Relationship between ex-vessel value and size composition of annual landings of shrimp from the Gulf and South Atlantic Coasts. Marine Fisheries Review.

Caillouet, C. W. and D. B. Koi. In press. Trends in ex-vessel value and size composition of annual landings of brown, pink and white shrimp from the Gulf and South Atlantic coasts of the United States. Marine Fisheries Review.

Hausknecht, K. A. 1980. Describe surficial sediments and suspended particulate matter. Vol. V. In: Jackson, W. B. and G. M. Faw (eds.). Biological/chemical survey of Texoma and Capline sector salt dome brine disposal sites off Louisiana, 1978-1979. NOAA Technical Memorandum NMFS-SEFC-29, 56 p. Available from: NTIS, Springfield, Virginia.

Landry, A. M. and H. W. Armstrong. 1980. Determine seasonal abundance, distribution and community composition of demersal finfishes and macro-crustaceans. Vol. IV. In: Jackson, W. B. and G. M. Faw (eds.). Biological/chemical survey of Texoma and Capline sector salt dome brine disposal sites off Louisiana, 1978-1979. NOAA Technical Memorandum NMFS-SEFC-28, 180 p. Available from: NTIS, Springfield, Virginia.

Margraf, F. J. 1980. Analysis of Variance of Gulf Coast shrimp data. Vol. IX. In: Jackson, W. B. and G. M. Faw (eds.). Biological/chemical survey of Texoma and Capline sector salt dome brine disposal sites off Louisiana, 1978-1979. NOAA Technical Memorandum NMFS-SEFC-33, 293 p. Available from: NTIS, Springfield, Virginia.

Parker, R. H. and A. L. Crowe. 1980. Describe living and dead benthic (macro- and meio-) communities. Vol. I. In: Jackson, W. B. and G. M. Faw (eds.). Biological/chemical survey of Texoma and Capline sector salt dome brine disposal sites off Louisiana, 1978-1979. NOAA Technical Memorandum NMFS-SEFC-25, 103 p. Available from: NTIS, Springfield, Virginia.

Reitsema, L. A. 1980. Determine seasonal abundance, distribution and community composition of zooplankton. Vol. II. In: Jackson, W. B. and G. M. Faw (eds.). Biological/chemical survey of Texoma and Capline sector salt dome brine disposal sites off Louisiana, 1978-1979. NOAA Technical Memorandum NMFS-SEFC-26, 133 p. Available from: NTIS, Springfield, Virginia.

Schwarz, J. R., S. K. Alexander, A. J. Schropp and V. L. Carpenter. 1980. Describe bacterial communities. Vol. III. In: Jackson, W. B. and G. M. Faw (eds.). Biological/chemical survey of Texoma and Capline sector salt dome brine disposal sites off Louisiana, 1978-1979. NOAA Technical Memorandum NMFS-SEFC-27, 48 p. Available from: NTIS, Springfield, Virginia.

Tillery, J. B. 1980. Determine trace metal composition and concentration in major components of the marine ecosystem. Vol. VII. In: Jackson, W. B. and G. M. Faw (eds.). Biological/chemical survey of Texoma and Capline sector salt dome brine disposal sites off Louisiana, 1978-1979. NOAA Technical Memorandum NMFS-SEFC-31, 72 p. Available from: NTIS, Springfield, Virginia.

II. PRINCIPAL INVESTIGATORS' SECTION

WORK UNIT 2.2 - DETERMINE SEASONAL ABUNDANCE, DISTRIBUTION AND COMMUNITY COMPOSITION OF ZOOPLANKTON

L. A. Reitsema, Ph.D.

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ABSTRACT

Five stations were sampled for zooplankton at each of two sites offshore Louisiana during four collection periods during 1978 and 1979. The West Hackberry site was approximately six miles southwest of Cameron, and the Weeks Island site was approximately 30 miles south of Marsh Island. A bongo net and neuston net were deployed three times at each station during four seasons. Each site is a proposed location for the offshore disposal of brine for the Strategic Petroleum Reserve Program. The purpose of this study was to characterize the sites in terms of the seasonal and spatial zooplankton and ichthyoplankton communities.

The two sites were similar in terms of dominant taxa and the density of planktonic organisms. The Weeks Island site collections had a greater mean displacement volume. The diversity, richness and evenness indices were higher for the samples collected at the Weeks Island site than for those from the West Hackberry site, indicating the presence of a greater number of species with a more equal distribution of individuals among taxa. Cluster analyses indicated greater differences between collecting dates than between sites in terms of the taxa collected and their densities. The Weeks Island site collections contained greater numbers of taxa and individuals of economic importance.

ACKNOWLEDGEMENTS

The collection and analysis of the sample data in this report would not have been possible without the help of numerous people. Assistance in the field and in the laboratory was provided by Mr. F.S. Lane, Mr. B. A. Adams, Dr. F.J. Margraf and Mr. D.W. Plitt. Mr. Lane also provided the majority of the taxonomic expertise on ichthyoplankton which went into this study. Dr. F.J. Margraf and Dr. D. Lukins did the statistical analyses, and Mr. K. Kuberski, Mrs. J. Erwin and Ms. A. Doerge assisted in compiling this report. The contributions of all these people and the cooperation received from everyone involved in the project is appreciated.

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APPENDIX B

BIOLOGICAL/CHEMICAL SURVEY OF PROPOSED SALT DOME BRINE DISPOSAL SITES (TEXOMA AND CAPLINE SECTORS) OFF LOUISIANA WORK UNIT 2.2 - ZOOPLANKTON

INTRODUCTION

Implementation of the Strategic Petroleum Reserve (SPR) program will result in large quantities of brine as a by-product. Presently, the brines which are, or will be, produced are planned to be disposed of in offshore ocean areas. Some five disposal sites are under consideration (Fig. 1) and each is the subject of comprehensive engineering, oceanographic, chemical and biological studies for impact assessment purposes. The purpose of this report is to characterize two of the proposed sites--Weeks Island and West Hackberry--in terms of their seasonal zooplankton attributes.

Marine zooplankton are particularly important to the trophic dynamics of oceanic systems. Many are herbivorous forms which enable the transfer of primary production to higher consumers of direct importance to man. Marine zooplankton are extremely diverse and have characteristic assemblages which are typically associated with specific water masses. Thus, zooplankton assemblages can often be used as biological indicators of the origin and quality of marine waters--and important in this instance--changes in water quality.

Zooplankton are characteristically divided into two groups: (1) those which spend their entire life cycle as plankton (holoplankton) and (2) those which are planktonic only in the egg and larval stages of development (meroplankton). The latter group includes larval fish (ichthyoplankton) and decapod crustaceans, many of which are of considerable commercial and sportsfishery value. Because of their historical value, these groups, in general, are much better known taxonomically than are other zooplankters.

In this study, species-level identifications were not attempted for all organisms captured; taxonomic emphasis was placed upon larval fishes, decapods, and other seasonal dominants.

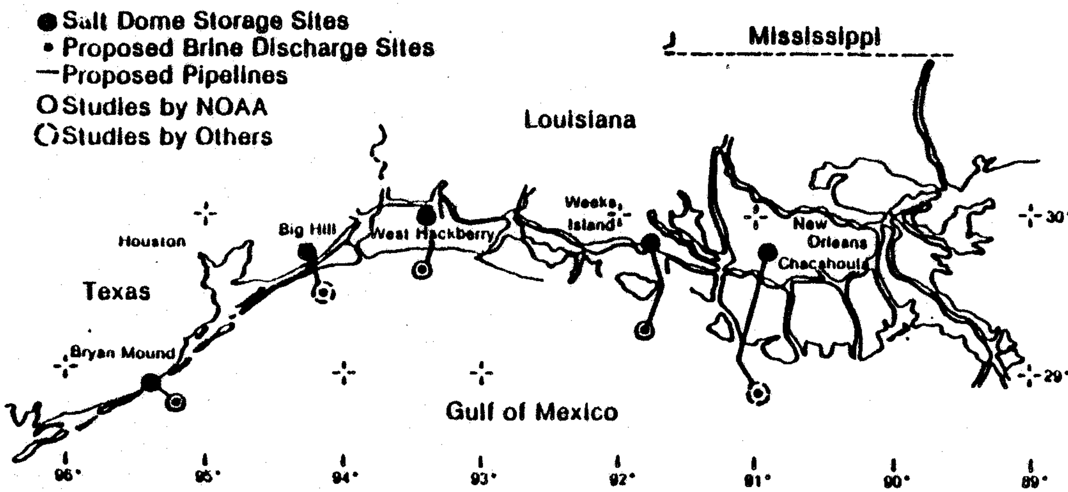

Fig. 1. Proposed brine disposal locations.

The specific objectives of the zooplankton studies were to:

- Estimate seasonal zooplankton biomass (displacement) at each station and site;
- Estimate seasonal taxa diversity and community structure and function of zooplankton at each station and site;
- Determine seasonal occurrence, abundance and distributional patterns of recreational and commercial species of ichthyoplankton and penaeid shrimp at each site;
- Characterize seasonal water quality (temperature, salinity, dissolved oxygen) at each station and site; and
- Based upon the above, other project data, and literature, characterize each site in terms of its importance as a seasonal spawning ground for fish and penaeid shrimp.

The project was initiated in March 1978. An initial cruise was made offshore Galveston, Texas on 7 June 1978 to adapt standard MARMAP zooplankton sampling methodology for use in shallow water. Seasonal cruises to each site were made in June and September of 1978 and in January and April of 1979.

STUDY AREAS AND METHODS

Five stations were sampled at each of the West Hackberry and Weeks Island offshore disposal sites (Fig. 2-4):

WEST HACKBERRY			WEEKS ISLAND		
Station	Latitude	Longitude	Station	Latitude	Longitude
A 2	29°39'46"	93°33'47"	B 2	29°06'58"	91°52'43"
A 6	29°41'59"	93°28'12"	B 6	29°07'31"	91°46'35"
A 8	29°40'00"	93°28'00"	B 8	29°05'42"	91°47'36"
A10	29°38'00"	93°27'52"	B10	29°03'55"	91°48'37"
A14	29°40'20"	93°22'17"	B14	29°03'26"	91°42'13"

Stations designated as 8 represented the proposed location of the diffuser; stations with 6 and 10 were two nautical miles inshore and offshore the diffuser, respectively; and stations with 2 and 14 were 5 nautical miles west and east of the diffuser, respectively. In essence, two transects were represented at each site; one parallel to shore (Stations 2, 8, 14) and the other perpendicular to shore (Stations 6, 8, 10).

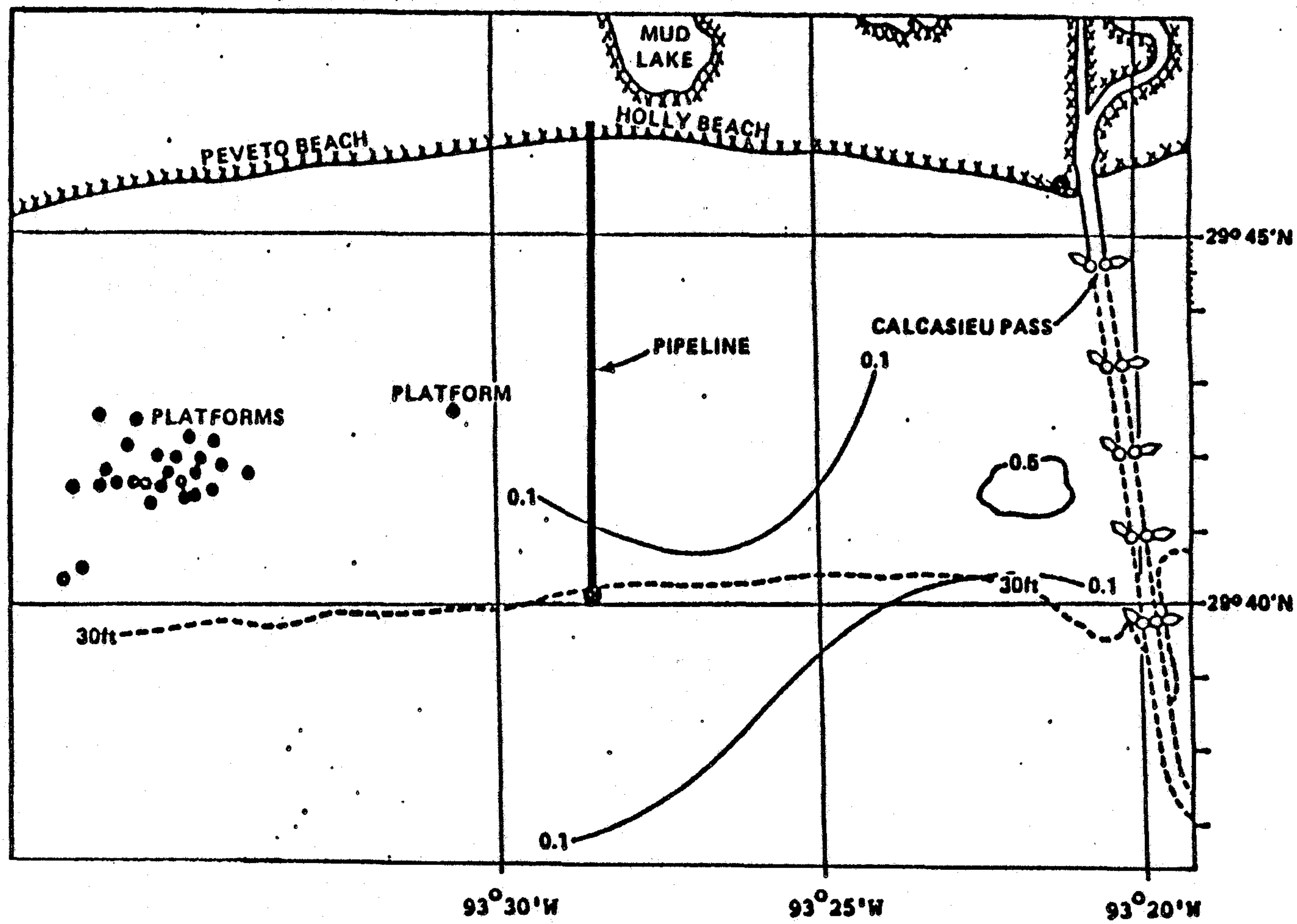

Fig. 2. Location of the West Hackberry site.

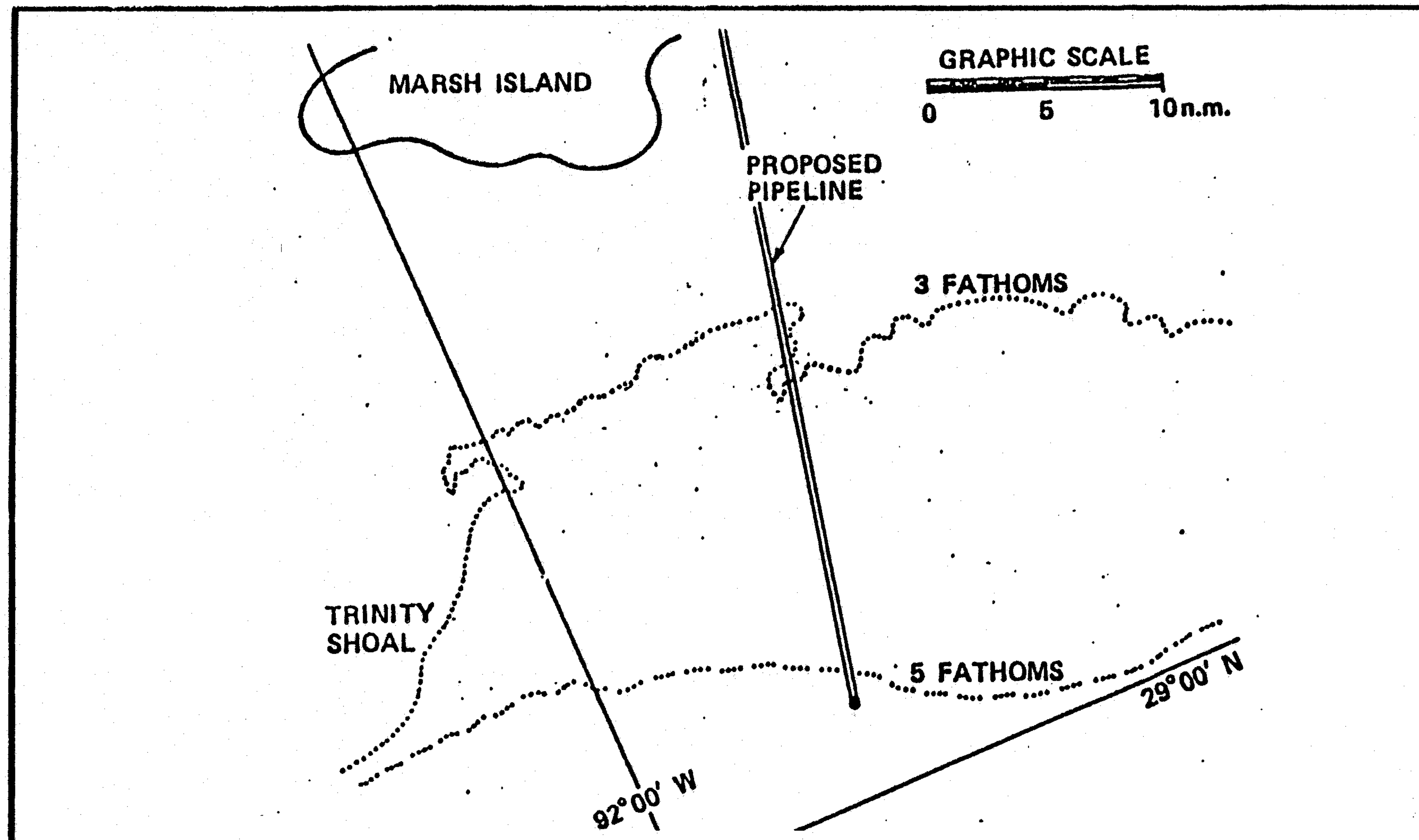

Fig. 3. Location of Weeks Island site.

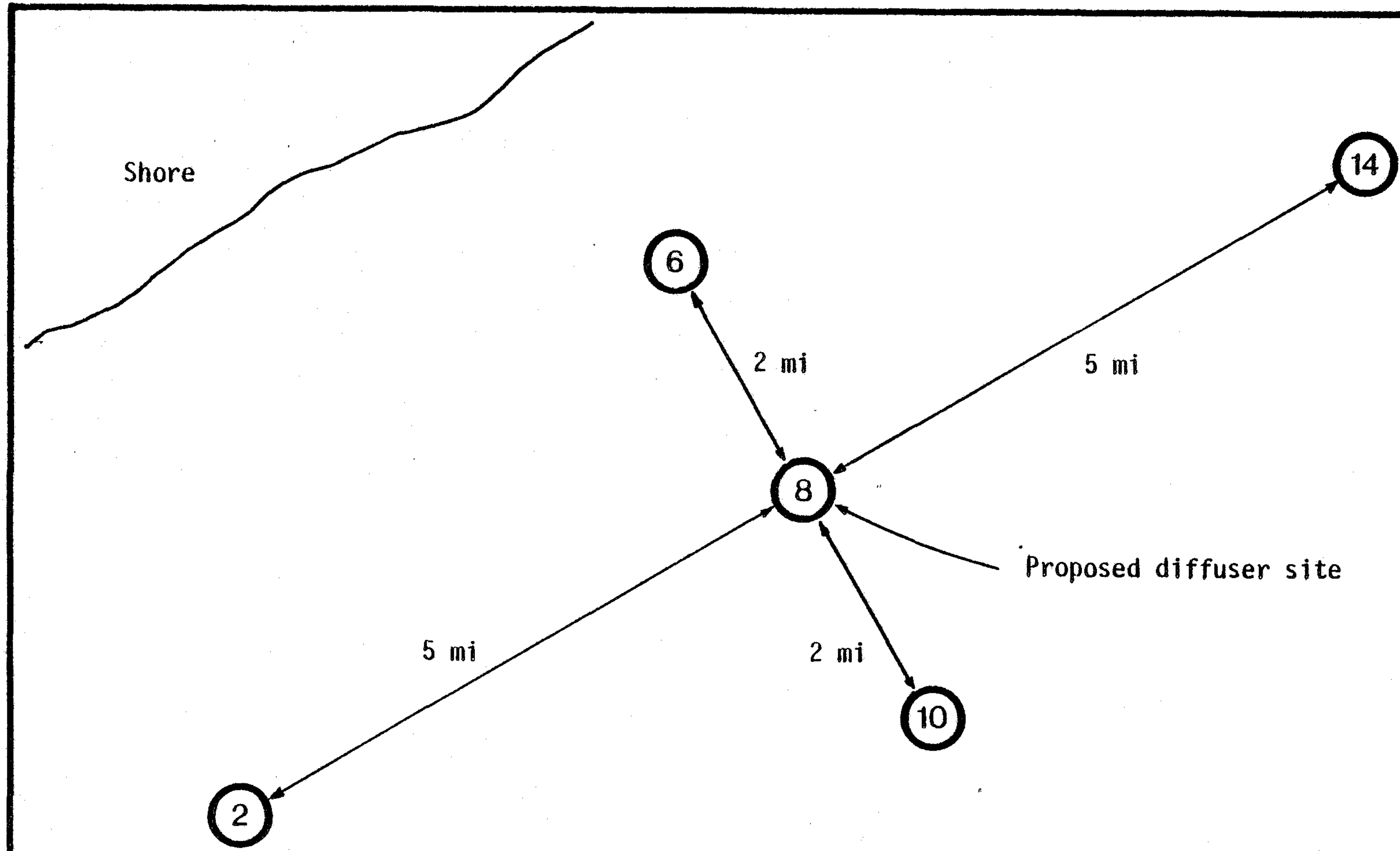

Fig. 4. Sample station array and numbering system used at each site.

Stations sampled for zooplankton represented only a part of the stations used by the entire project.

Hydrographic data and zooplankton samples were collected at each station on a seasonal basis. Water depth, temperature, conductivity and dissolved oxygen measurements were made using a Hydrolab System 8000 (Appendix C) having a conductivity probe range of 0-200 μmhos/cm. Measurements were made at the surface, mid-depth and bottom of the water column. When pronounced stratification was evident, additional measurements were taken to determine the location of the discontinuities. Weather conditions and sea state were recorded at each station.

Zooplankton was sampled in triplicate and at night, using two gear types: (1) standard MARMAP bongo nets and (2) a neuston net. The MARMAP bongo net (67 cm mouth with 0.333 and 0.505 mm mesh sizes) was pulled from the stern of the vessel utilizing the A-frame rigging on the *Gus III*. A 50 pound weight was attached to the frame of the net. A 45° wire angle was maintained through changes in boat and winch speed. The net was let out until it reached the bottom, then was retrieved and washed down with a seawater hose over the stern of the vessel. Flowmeters, present in each net, were read before and after each tow. Tow duration was determined using a stopwatch. Any evidence of net-fouling (physical contact with bottom, towing problems, etc.) warranted the disqualification of those samples. The neuston net (mouth size 0.5 x 1.0 m, 0.505 mm mesh) was towed from the port side of the vessel using a block just off the stern at the same speed as the bongo nets. The top of the frame was maintained 10-20 cm above the water surface for a 3-min tow duration.

Following each tow, the cod ends of both net types were removed and samples were funneled into a sample jar through a 0.6 cm mesh screen to remove large detrital material as well as large ctenophores and coelenterates, which were discarded. Samples were preserved in 7% buffered formalin, labeled and stored for laboratory workup.

In the laboratory, sample displacement was measured using a Yentsh plankton volume gauge. Each sample was then placed in a tray and examined. All fish, fish eggs, and postzoeal decapod crustaceans were sorted, identified to the lowest practicable taxon and placed in labeled vials. The remainder of the sample was subdivided using a Folsom sample splitter, sorted, counted and placed in labeled jars. Sample components were identified and enumerated under magnification. Fish could generally be identified to the family level at sizes > 3-4 mm in length with larger sizes permitting further taxonomic definition.

Data Analysis

Data analysis consisted of tabularizing the data and comparing communities using cluster analysis and diversity indices, and performing analysis of variance on selected community and population parameters. Duncan's Multiple Range Test was used to evaluate the seasonal means for each parameter tested. Cluster analysis was used to characterize the contrast the communities presented at each station. Cluster analysis involves the use of a dissimilarity measure to determine the degree of association between pair-wise combinations of data units based on some variables (Clifford and Stephenson 1975). For our application, the data units consisted of stations by season while the density of each taxa comprised the variables. The clustering of stations by season based on the variables (taxa composition) is referred to as normal analysis. An inverse analysis, clustering variables (taxa) based on data units (stations) was also performed. The Bray-Curtis dissimilarity measure was utilized for analysis using a flexible sorting strategy with the cluster intensity coefficient set at -0.25 following the recommendations of Clifford and Stephenson (1975). To reduce the bias of a few disproportionately high values, a root transformation was performed on the data for the normal analysis, such that the maximum value was reduced to about 20. For the inverse analysis, a norm standardization was applied in addition to the root transformation. The results of the cluster analysis are displayed as dendrograms, one for the normal and one for the inverse analysis. A two-way contingency table is used to show the relationship between station and species clusters. Since no satisfactory statistical methods are presently available, major clusters or groups are separated based upon the degree of dissimilarity exhibited in the dendrograms and characteristics of the two way table. Cluster analysis was performed using the program CLASS developed and installed at the Texas A&M University

Data Processing Center by Dr. Robert Smith of the University of Southern California.

Species Diversity

Characterization of community structure at each station was made using indices of diversity. Pielou (1969) considers diversity to be a single statistic of a collection that compounds the number of species present with species evenness. A collection is said to have high diversity if it has many species and the species abundance is fairly even. Conversely, diversity is low when the species are few and their abundance uneven. The value, however, is ambiguous, since a collection with few species and high evenness could have the same diversity as another collection with many species and low evenness. Diversity, *per se*, is not very informative unless its components, evenness and richness, are identified separately.

Diversity was calculated using the Shannon-Weaver index as suggested by Pielou (1966a). The index (H") was calculated by the formula:

$$H'' = -\sum_{i=1}^{n} \frac{n_i}{N} \ln \frac{n_i}{N}$$

where: n = the density of individuals in the ith species
N = total density of individuals in the collection

The index is reasonably independent of sample size (Odum 1971) and is normally distributed (Bowman et al. 1970). Because natural logarithms are used in the computations, the diversity unit is expressed as a "natural bell" (Pielou 1969).

The evenness component of diversity was computed using Pielou's (1966b) index as follows:

$$J = \frac{H''}{H''\ \max} = \frac{H''}{\ln S}$$

where: H" = observed diversity computed in the Shannon-Weaver index
H" max = the maximum diversity value for the number of species present (ln S)
S = number of species present in the collection

Evenness, therefore, represents a ratio of the observed diversity to the maximum diversity for the number of species present in the collection.

An additional component of diversity is species richness or variety. This is a measure of the number of species occurring in the community relative to the total density of individuals. Species richness was calculated by the Dahlberg and Odum (1970) model as follows:

$$D' = \frac{S - 1}{\ln N}$$

where: S = number of species in the collection
N = total density of individuals in the collection

The index, of course, is dependent upon sample size. However, it provides a useful measure of variety between communities.

Data Transformations and Analysis of Abundance Patterns

If sample data are to be analyzed using Normal Theory statistics (e.g., Analysis of Variance, etc.), then certain assumptions concerning the statistical properties of the data must be made (Steel and Torrie 1960). Most importantly, the observations are supposed to be independent of one another and chosen in a random fashion. Such considerations should be incorporated as integral aspects of the field sampling design. After data are collected, a third assumption becomes important: sample variances should be homogeneous regardless of the magnitude of the means. However, the variances of most zooplankton density data increase explosively (negative binomial) with an increase in mean. Therefore, it is generally necessary to apply a $\log_e$ transformation to the data in order to stabilize the variances (Steel and Torrie 1960). To avoid the problem of taking the log of zero, one (1) was added to each observation.

The statistical properties of samples from biological communities may have the characteristics of one of several statistical distributions (Pielou 1966b). Quite often, however, the statistical properties of zooplankton density data will approximate a negative binomial distribution. Negative binomial-like properties arise when individuals are located in patches or clusters. These clusters may be the result of either heterogeneity of environment (e.g., depth of water) or social grouping of the individuals (e.g., fish schools). The variance of a negative binomial distribution increases at a greater rate with increasing mean.

Following a $\log_e$ transformation, the data were subjected to Analysis of Variance (ANOVA) techniques. Duncan's Multiple Range tests were also performed on season means. The ANOVAs were performed using the Statistical Analysis System (SAS) available at the Texas A&M University Data Processing Center.

RESULTS

The entire contracted total number of samples (4 cruises x 3 nets x 3 replicates x 5 stations x 2 sites = 360) were collected, analyzed and are included in results presented here. To facilitate the presentation and discussion of the species accounts, only the results from the 0.333 mm mesh bongo net collections will be utilized unless otherwise indicated. The collections were selected because they contain the largest numbers of organisms and yield more information than either the 0.505 mm mesh bongo net or neuston net. The four collections are referred to as spring (April 1979), summer (June 1978), fall (September 1978) and winter (January 1979).

Water Quality Data

Seasonal water quality parameters (temperature, conductivity and dissolved oxygen) and weather conditions at the West Hackberry and Weeks Island sites are presented in Tables A1-8. Differences among stations at the respective sites were minimal; thus, the profiles for the diffuser sites may be considered representative of each site (Fig. 5). The temperature probe was damaged on the spring cruise, and spring temperature data was obtained for 30 April to 2 May 1979 from EDIS. A vertical stratification of the water mass was found at West Hackberry in summer 1978. A temperature decrease of 3°C, a conductivity increase of 15 μmhos/cm and an oxygen decrease of 7 mg/ℓ were documented during the summer cruise at West Hackberry. These data were all indicative of a colder, more saline water mass underlying the warmer, less saline surface waters. These conditions resulted in the development of anoxic conditions near the bottom. Relatively small vertical differences (1.5°C, 5 μmhos, 2 mg/ℓ) were found at the Weeks Island site for the same time period. The conductivity values at Weeks Island were similar to those for the more saline underlying water mass at West Hackberry.

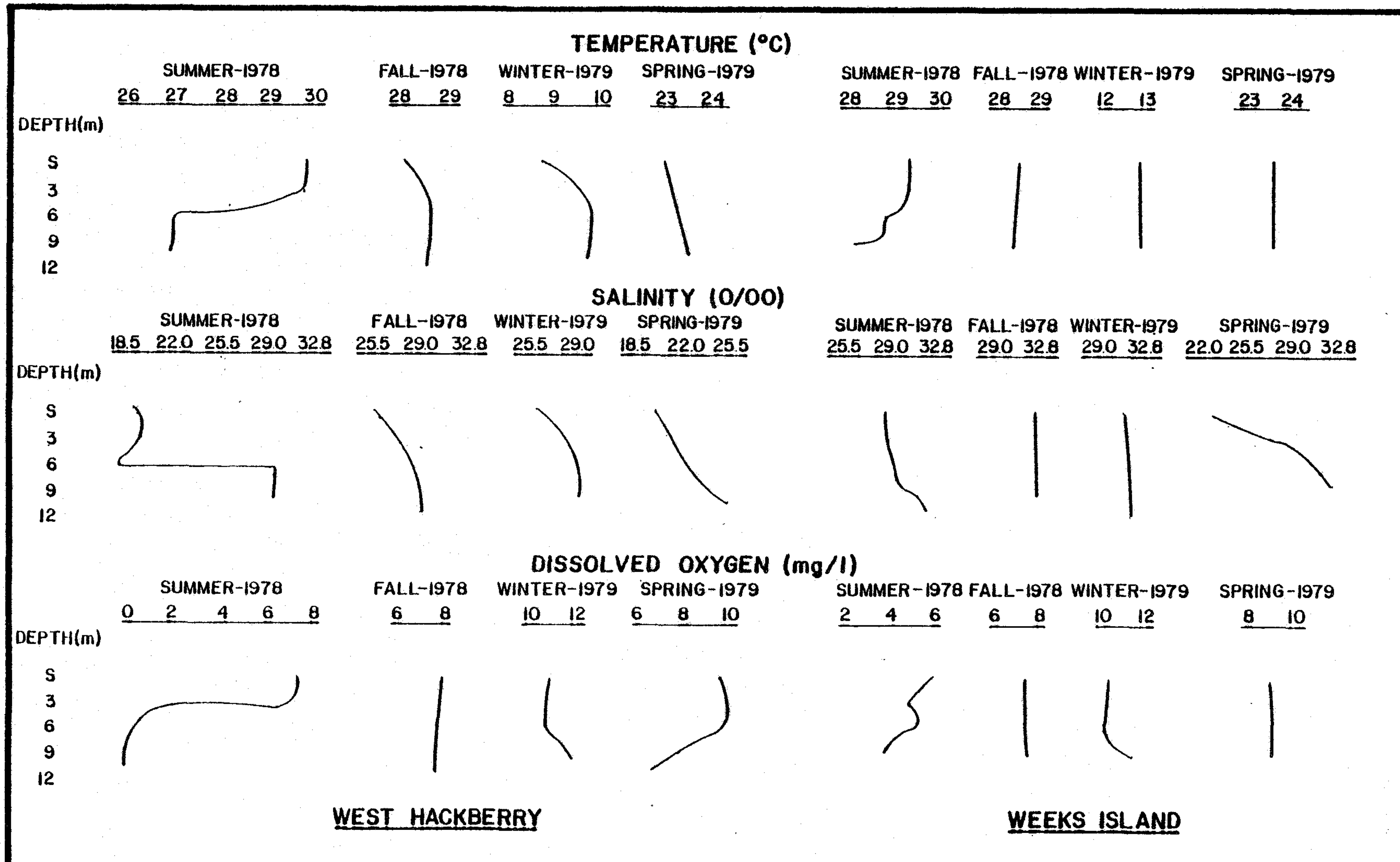

Fig. 5. Hydrographic data from the West Hackberry and Weeks Island central stations 8.

During fall and winter cruises, vertical differences in water quality parameters were less pronounced at the West Hackberry site and virtually non-existant at the Weeks Island site. Conductivity determinations during fall and winter indicated a decrease in the warmer, less saline water mass near the surface at West Hackberry. While temperature and oxygen profiles did not change shape from fall to winter, the temperature dropped approximately 20°C and the dissolved oxygen concentration increased about 3 mg/ℓ.

In spring 1979 the conductivity decreased to summer 1978 levels at West Hackberry and the lowest yearly levels at the Weeks Island site. At both sites, a presumably warmer, less saline water mass occurred over the cooler, more saline bottom water. Dissolved oxygen profiles showed no v rtical stratification in oxygen concentration at the Weeks Island site and an orthographic oxygen curve at the West Hackberry site.

Biological Data

A total of 139 taxa of planktonic organisms comprised of fish and invertebrate taxa were identified from the bongo net collections. A greater mean number of taxa were obtained from the Weeks Island site (32) as opposed to the West Hackberry site (20). The numbers of taxa collected were significantly different for each season (α = .01), site (α = .01) and, except for fish taxa, for stations (α = .01) within a site. The greatest number of invertebrate taxa collected at the Weeks Island site (36) were obtained in the summer. At the West Hackberry site, the fall collections contained the greatest number of taxa (21). The lowest numbers were obtained in the spring at both sites. Appendix B lists all taxa which were collected and their densities by site, season and net type.

Displacement Volume and Density

Total displacement volumes were calculated for each collection and standardized by the water volume filtered for the bongo net samples (Table A9, Fig. A1). Of the West Hackberry collections, station 8 (the proposed diffuser head site) had the greatest mean displacement volume for the combined 0.333 and 0.505 mm mesh bongo nets (5988 ml/100 m^3) over the entire study period. The lowest mean volume was obtained at station 6 (1793 ml/100 m^3). The fall season mean displacement volume was the lowest for all stations combined (1669 ml/100 m^3), while the spring collection yielded the highest mean value (5058 ml/100 m^3). Considering the 0.505 mm mesh bongo net collections separately, the greatest mean seasonal displacement volume was obtained in the summer.

The mean density (individuals/m^3) data for the invertebrates from the West Hackberry sites followed the same pattern, with the greatest mean densities obtained at station 8, and occurring in the spring season (Table A10, Fig. A2). Once again, the separate value for the 0.505 mm mesh net was greater in the summer than in the spring indicating that the greater displacement volume observed was not solely due to the growth of organisms between sample periods. The densities of fish were highest in the spring collections and lowest in those from the winter (Table A11, Fig. A3).

Mean displacement volumes of the Weeks Island collections were significantly greater (α = .001) than that of those from the West Hackberry site. The largest collections were obtained in the summer as opposed to the spring at the West Hackberry site. The fall collections again had the lowest mean displacement volumes. Station 10 collections had the largest values, followed by those from station 8. Station 6 collections had the lowest mean displacement volumes. As expected, the 0.333 mm mesh net samples had much larger mean displacement volumes than the 0.505 mm mesh net samples.

The combined displacement volumes from the two sites were significantly different over seasons and stations. A Duncan's Multiple Range Test (α = .05) on the 0.505 mm mesh bongo net samples indicated that the mean summer volume was significantly greater than that of the spring and fall, and that the fall volume was significantly lower than that of the summer and winter. For the 0.333 mm mesh bongo net samples, the fall value was again significantly lower.

The mean density of invertebrate taxa at the Weeks Island site was greater than that at the West Hackberry site, but the proportional increase was lower than the observed displacement volume increase. This indicates that the animals collected at Weeks Island were, on the average, larger than those collected at West Hackberry. This may be explained, in part, by the preponderance of *Acartia* sp. (a small calanoid copepod) in the West Hackberry site collections. The mean density of invertebrates decreased from spring to winter. Significant differences (α = .01) occurred between seasons, sites, and stations.

The density of fish taxa differed from the invertebrate taxa density in that it was significantly lower than that found at the West Hackberry site (α = .0001). As with the invertebrates, the density decreased progressively from spring to winter. Seasons and stations within the sites had significantly different densities (α = .001).

Diversity, Richness and Evenness

The Shannon-Weaver species diversity index (H') was calculated for each collection (Tables A12,13; Figs. A4,5). At the West Hackberry site the greatest diversity was observed in the fall for the invertebrates and in the summer for the fish. This is probably due to the invertebrates being dominated more by large numbers of relatively few species in the spring and summer, when their diversity indices were lowest. Diversity indices of the invertebrates were higher for the 0.505 mm mesh net since many of the dominant taxa were small and were not captured except in the 0.333 mm mesh net. By the fall season, many of the fish were large enough to avoid capture in the nets, resulting in their lower diversity index at that time. Richness and evenness indices (Tables A14,15) confirmed these findings. Total numbers of taxa are shown in Figs. A6,7. No station had a consistently greater diversity index than the others for either fish or invertebrates.

At the Weeks Island site, the invertebrate species diversity indices (H') were highest in the summer collections. Those for the fish were highest in the collections from the fall. The low diversity index values in the fall samples in the 0.333 mm mesh bongo net were probably due to the large number of cladocerans present. The richness and evenness data confirm this, as does the numbers of taxa collected. This large depression for the fall invertebrate diversity index is not seen for the collections from the 0.505 mm mesh bongo net. Considering the entire data set, significant differences occurred between sites and seasons (α = .001) for both invertebrates and fish taxa, and between stations within the sites (α = .01) for the invertebrates only.

Species Accounts

Acartia tonsa dominated the invertebrate collections from the spring samples, comprising 96.1 and 91.2% of the mean density of the West Hackberry and Weeks Island site, respectively (Table A16). The most abundant non-copepod invertebrate was *Sagitta* sp. at each site, although it was 23 times more abundant at the Weeks Island site than at the West Hackberry site (9785/100 m^3 *vs.* 417/100 m^3). The Engraulidae was the dominant fish family collected at both sites (Table A17). *Anchoa mitchilli* was the most common Engraulid, particularly at the Weeks Island site (55.1% at West Hackberry and 80.0% at Weeks Island). The Clupeidae was the second most abundant fish family at the West Hackberry site (25.1/100 m^3). At the Weeks Island site the second most abundant family was the Sciaenidae, although their density at the site was lower than it was at the West Hackberry site (13.4 *vs.* 15.4%). The family Gobiidae was represented only at the Weeks Island site.

The summer invertebrate collections from the West Hackberry site continued to be dominated by *Acartia tonsa*, while its relative dominance was considerably less in the Weeks Island site collections (Table A18). The mean density of *A. tonsa*, however, was lower than it had been in the spring collections. Cladocerans (probably *Pogon* sp. and *Evaden* sp.) were the most abundant invertebrate taxon collected at the Weeks Island site, with 1842 individuals/m^3, followed by *Temora* sp. with 217 individuals/m^3 and polychaetes with 153 individuals/m^3. *Labidacera* sp. and *Oikoplaura* sp. were the second and third most abundant taxa at the West Hackberry site (122 and 28 individuals/m^3, respectively).

The relative abundance (as determined by % total density) of the Engraulidae was lower in the summer collections than it had been in the spring, although they remained an important part of the community, being the second most abundant fish family at each site (Table A19). The fish family with the greatest mean density was the Clupeidae at the West Hackberry site and Carangidae at the Weeks Island site. Few Clupeids were present in the Weeks Island collections, and few Carangids were in the West Hackberry collections; an indication of a considerable difference between the sites. The Sciaenidae were the third most abundant fish family at each site. Small benthic fish belonging to the families Bothidae and Cynoglossidae were found only in the Weeks Island collections, as were the Ephippidae. This may be related to the hydrographic conditions which existed during this collecting period when the oxygen content of the bottom waters approached zero. There also may be a relationship between the presence of the Ephippidae only at the Weeks Island site, and the presence of more oil production platforms in the immediate area than are found at the West Hackberry site (Gallaway et al. 1979).

Although copepods remained to be the most abundant group in the fall invertebrate collections from the West Hackberry site, *Temora* sp. replaced *Acartia tonsa* as the dominant taxon, accounting for 39.8% of the total density (Table A20). The second and third most abundant taxa at this site, unidentified copepods and *Eucalanus* sp., respectively, were relatively more abundant than previously (spring and summer), comprising 26.7 and 10.0% of the total density. At the Weeks Island site, *Temora* sp. was also the dominant invertebrate, but accounted for a greater percent of the total (81.6%). *Sagitta* sp. and unidentified copepods were next in the order of dominance at the Weeks Island site, representing 6.1 and 5.3%, respectively, of the total density. *Eucalanus* sp. was the fourth most abundant taxon on the Weeks Island site, accounting for 1.6% of the total density, although the mean density for this taxon (32.1 individuals/m^3) was about the same as it was at the West Hackberry site where it had a mean density of 32.6 individuals/m^3. Cladocerans, which had been very abundant at the Weeks Island site in the summer, were relatively rare in the fall, with a density of only 39 individuals/100 m^3.

In terms of the relative abundance of fish families, the fall collections from the two sites were more similar than they had been for any other season (Table A21). The Sciaenidae had the greatest density of any fish family in the fall collections from both sites. These were primarily of the genus *Cynoscion*, although the genera *Micropogon* and *Bairdiella* were also prominent. The Engraulidae became the fourth most abundant fish family at both sites. The Carangidae and Clupeidae each accounted for 28.4% of the total density in the Weeks Island collections and were the second and third most abundant families at each site. These four families (Clupeidae, Engraulidae, Carangidae and Sciaenidae) contained more than 99.9% of the fish identified from the fall samples.

The mean density of *Temora* sp. was more than twice as great in the winter invertebrate collections from the West Hackberry site than it had been in those from the fall, although it fell from first to second in relative abundance (Table A22). *Acartia tonsa* was the dominant invertebrate taxa at the West Hackberry site in the winter, accounting for 58.6% of the total density. This taxa was also the most abundant one in the Weeks Island site collections (43.8% of the total density), and *Sagitta* sp. was the third most common form at each site in approximately equal numbers: 101 individuals/m^3 at the West Hackberry site and 105 individuals/m^3 at the Weeks Island site (8.6 and 10.3%, respectively). The mean densities of the invertebrate taxa from the two sites more nearly equal those from the winter collections than any other season.

The winter fish collections were notable in that there were very few Engraulidae and Carangidae at either site (Table A23). The Clupeidae and Sciaenidae comprised the first and second most abundant fish families found in the winter at both sites. These two families accounted for 94.1 and 92.3% of the total density of fish which were identified at the West Hackberry and Weeks Island sites, respectively. Two families, Gobiidae and Bothidae, were found at both sites in the winter, whereas they had only been found in collections from the Weeks Island site in other seasons.

Thus, *Acartia tonsa* was most abundant and dominant in the spring, decreasing in numbers through the summer and fall and increasing in abundance again in the winter. *Sagitta* sp. was most abundant at the two sites during the fall and winter seasons. The Engraulidae and Sciaenidae were most numerous in the spring and summer. Attaining their peak abundance somewhat later, the Carangidae were most numerous in the summer and fall.

Nine fish and three invertebrate taxa were collected only in the neuston net (Table A24). None of these fish taxa were common, never being found at both sites and only a few were captured in more than one season.

Cluster Analyses

The Bray-Curtis dissimilarity index of sites and seasons for the 0.333 mm mesh bongo net (Fig. A8) indicates that during the fall, winter and spring, collections from the two sites were more similar to each other than to collections from the same site from different seasons. The summer collections from the West Hackberry site were more similar to the spring collections, and the summer Weeks Island site collections were more similar to those from the fall than they were to each other. The two-way table resulting from the site-season and taxon cluster is summarized in Table A25 and revealed the presence of eight species assemblages in the data (Table A26). Each assemblage was relatively dissimilar to the others.

Assemblage A was made up of taxa with low densities which were found only in the summer season. Assemblage B consisted of taxa with high densities which were found primarily during the summer season, with the larger contribution from the Weeks Island site. A group of taxa of medium density found mainly in the summer and fall made up Assemblage C. The Weeks Island site collections dominated Assemblage D, the taxa of which had low densities and were found more commonly in the fall season. Assemblage E was comprised of taxa which were found in various densities throughout the year. Much like Assemblage B, Assemblage F was made up primarily of taxa collected from the Weeks Island site during the summer, although their densities generally were greater. The taxa comprising Assemblage G had relatively high densities and were collected in all seasons from both sites. Assemblage H was composed of only two taxa which were found only in the fall at the Weeks Island site (station 2).

The results of the Bray-Curtis dissimilarity analysis of the 0.505 mm mesh bongo net collections show that the plankton populations at the two sites were least alike during the fall season (Fig. A9). The summer collections from the Weeks Island site were most similar to the fall

Weeks Island collections, and the summer West Hackberry collections were more similar to the spring collections from both sites than to any other group. The fall West Hackberry collections were most similar to the winter collections from both sites. Eight species assemblages were derived from the cluster analyses (Tables A27,28).

The neuston net cluster analyses results were similar to those from the 0.333 mm mesh bongo net in that the summer collections were more dissimilar than those from any other season (Fig. A10). The two-way table indicated the presence of seven species assemblages (Tables A29,30).

SUMMARY AND CONCLUSIONS

The family Penaeidae was represented in the collections by the genera *Trachypenaeus, Xiphopenaeus,* and *Sicyonia.* A single specimen from the West Hackberry summer collections was identified as being a *Penaeus* sp., but was too small for absolute identification. *Xiphopenaeus* sp. were collected from the West Hackberry site during the summer and fall and from the Weeks Island site in the summer, fall and winter. The West Hackberry site collections contained *Trachypenaeus* sp. in the fall, and they were found in the Weeks Island site collections in the summer and fall. Greater numbers of individuals of both genera were found at the Weeks Island site. *Sicyonia dorsalis* were collected in small numbers in the fall at both sites.

In the shallow water areas investigated by our study, *Penaeus setiferus* (white shrimp) would be expected to be the dominant spawning species of *Penaeus*. Larval *Penaeus* sp. were found in shallow water offshore south Texas by Jackson (1975) primarily between April and October, with peaks of abundance in the spring. Baxter and Renfro (1966) observed these same peaks of abundance off Galveston Island for brown (*P. aztecus*) and white shrimp. Planktonic stage *Penaeus* spp. were found in low numbers in the West Hackberry study area for all seasons but winter by Temple and Fischer (1967). Barrett and Gillespie (1973) discuss Louisiana shrimp production in relation to various environmental parameters.

While this study did not demonstrate that the sites were spawning or nursery sites for Penaeids other than *Xiphopenaeus* and *Trachypenaeus*, it is still possible that the area may be important to the genus *Penaeus* but that our collections were not obtained during the periods when the shrimp were abundant in the plankton. Even so, our collections should have contained some *Penaeus* if the areas were nursery areas, as the spawning season extends over a period of several months.

Several important fish taxa utilized the areas as spawning and nursery sites. The Clupeidae were the most abundant fish family of commercial importance and were present in relatively large numbers at both sites. The bothids and lutjanids are also commercially important and were found primarily at the Weeks Island site. Several families represented in the collections are of importance to the sportfishing industry, including the Carangidae, Sciaenidae, Scombridae, Bothidae, and Lutjanidae. The latter three were represented in more collections from the Weeks Island site than in those from the West Hackberry site, and the first two were represented in greater numbers at the Weeks Island site.

The two sites were not radically different from each other in terms of dominant taxa, with exceptions being the large number of Cladocerans collected at Weeks Island in the spring and the greater dominance of Clupeids in the spring and summer in the West Hackberry collections (Tables A31,32). The mean standard displacement volume was greater for the Weeks Island site collections than for West Hackberry collections during all seasons. The mean densities of the collections from the two sites were more similar, the greatest differences being in the spring invertebrate samples where the density at the West Hackberry site was 6882 individuals/100 m^3 and the density at the Weeks Island site was 3520 individuals/100 m^3. In the winter fish samples, 90 fish/100 m^3 were found in the Weeks Island collections and 13 fish/100 m^3 were found in the West Hackberry collections.

Perhaps the most significant differences in the data collected from the two sites are that the diversity, richness and evenness indices are higher for the Weeks Island site collections than those for the West Hackb rry site. This indicates the presence of a greater number of taxa with less dominance by one or two very abundant taxa at the Weeks Island site than at West Hackberry. The low fall diversity index at the Weeks Island site was due to the large number of *Temora* sp. in the samples. The richness index indicated a larger number of taxa were present in that season than were found at the West Hackberry site, and the low evenness index shows the effect of the *Temora* sp. dominance. The community composition was quite similar between the sites and is more representative of a coastal area influenced by land runoff than of an open water, oceanic community.

Cluster analyses indicated greater differences between collecting dates than between sites or stations. The species assemblages derived from the species clusters provide a foundation for temporal analyses of the sites, although clusters from collections from different nets were quite dissimilar.

In general, this study has provided important background data for impact assessment, but the inherent variability in plankton populations requires a larger data base than that included herein for definitive population analyses over time.

LITERATURE CITED

Barrett, B.B. and M.C. Gillespie. 1973. Primary factors which influence commercial shrimp production in coastal Louisiana. La. Wildlife and Fisheries Commission, August 1973.

Baxter, K.N. and W.C. Renfro. 1966. Seasonal occurrence and site distribution of postlarval brown and white shrimp near Galveston, Texas, with notes on species identification. Fish. Bull. 66(1):149-158.

Bowman, K.O., K. Hutcheson, E.P. Odum and L.R. Shenton. 1970. Comments on the distribution of indices of diversity. *In*: International symposium on statistical ecology, Vol. 3. Pennsylvania State University Press.

Clifford, H.T. and W. Stephenson. 1975. An introduction to numerical classification. Academic Press, Inc., New York. 229 p.

Dahlberg, M.P. and E.P. Odum. 1970. Annual cycles of species occurrence, abundance and diversity in Georgia estuarine populations. Am. Midl. Nat. 83(2):382-392.

Gallaway, B.J., M.F. Johnson, R.L. Howard, L.R. Martin and G.S. Boland. 1979. A study of the effects of Buccaneer Oil Field structures and associated effluents on biofouling communities and the Atlantic Spadefish (*Chaetodipterus faber*). Report to National Marine Fisheries Service, Galveston, Texas. LGL Limited-U.S., Inc., Bryan, Texas. 126 p.

Jackson, W.B. (Ed.). 1975. Environmental studies of the South Texas outer continental shelf. Volume I, Plankton and fisheries. NOAA Final Report to BLM, May 1976. 425 p.

Odum, E.P. 1971. Fundamentals of ecology. Third Ed. W.B. Saunders Co., Philadelphia. 574 p.

Pielou, E.C. 1966a. Shannon's formula as a measure of specific diversity:its use and misuse. Am. Nat. 100(914):463-465.

Pielou, E.C. 1966b. The measurement of diversity in different types of biological collections. J. Theor. Biol. 13:131-144.

Pielou, E.C. 1969. An introduction to mathematical ecology. Wiley, New York.

Steel, R.G.D. and J.H. Torrie. 1960. Principles and procedures of statistics. McGraw-Hill, Inc., New York. 481 p.

Temple, R.F. and C.C. Fischer. 1967. Seasonal distribution and relative abundance of planktonic-stage shrimp (*Penaeus* sp.) in the northwestern Gulf of Mexico, 1961. Fish Bull. 66(2):323-334.

APPENDIX A

Tables and Figures

Table A1. Hydrographic data from the spring collection trip (April 1979).

Station	Date	Time	Depth (m)	Temperature ** (°C)	Conductivity (μmhos/cm)	Dissolved Oxygen (mg/ℓ)
A-2	5 Apr 79	2340	Surface	23.0	31,500	8.35
			5.0	23.0	32,200	7.91
			10.2*	23.0	38,100	6.90
A-6	6 Apr 79	0100	Surface	22.5	31,000	8.30
			4.0	22.5	32,500	7.94
			8.2*	23.0	36,800	6.69
A-8	5 Apr 79	2210	Surface	23.0	32,300	9.66
			5.0	23.0	34,500	10.10
			10.4*	23.5	39,500	6.52
A-10	5 Apr 79	2115	Surface	23.5	35,000	9.55
			6.0	23.5	35,900	9.17
			9.0	23.5	40,000	7.42
			10.0	23.5	41,100	7.30
			11.7*	23.5	41,200	7.47
A-14	6 Apr 79	0240	Surface	22.5	34,900	9.40
			5.0	22.5	35,300	9.02
			6.0	22.5	38,000	7.72
			7.0	22.5	41,500	6.88
			10.3*	22.5	41,900	6.96

Table A1 (cont'd).

Station	Date	Time	Depth (m)	Temperature** (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/ℓ)
B-2	4 Apr 79	1940	Surface	23.5	36,900	9.27
			1.0	23.5	37,800	9.05
			2.0	23.5	38,600	9.09
			3.0	23.5	46,400	8.87
			3.6	23.5	47,600	8.85
			7.4*	23.5	47,900	8.60
B-6	4 Apr 79	2130	Surface	24.0	35,700	8.89
			1.0	24.0	34,500	8.72
			2.0	24.0	38,100	8.77
			3.0	24.0	40.400	8.87
			6.7*	24.0	46.500	9.10
B-8	4 Apr 79	2240	Surface	23.5	36.000	9.00
			4.0	23.5	44,000	9.10
			8.3*	23.5	48,500	9.21
B-10	4 Apr 79	2330	Surface	23.75	34,400	8.87
			4.5	23.5	46,900	9.02
			9.0*	23.5	46,700	9.62
B-14	5 Apr 79	0110	Surface	24.0	37,200	8.80
			3.6	23.5	41,000	8.90
			7.1*	23.5	48,700	8.67

*Bottom reading.

**Data obtained from a subsequent cruise at the same stations between 30 April and 2 May 1979, courtesy, EDIS.

Table A2. Hydrographic data from the summer collection trip (June 1978).

Station	Date	Time	Depth (m)	Temperature (°C)	Conductivity (µmho/cm)	Dissolved Oxygen** (mg/ℓ)
A2	15 Jun 78	0200	Surface	29.3	32,800	6.9
			3.0	29.5	33,200	6.9
			5.0	29.4	33,200	6.9
			6.5	28.1	38,200	0.6
			8.0	26.7	45,700	0.1
			10.0*	26.7	45,700	0.1
A6	14 Jun 78	2345	Surface	28.9	29,500	6.8
			4.0	28.9	31,200	6.9
			6.5	27.9	35,400	3.1
			7.9*	27.1	44,600	0.2
A8	14 Jun 78	2230	Surface	29.6	31,500	7.2
			3.0	29.5	31,500	7.2
			5.0	28.0	29,300	1.0
			6.4	26.8	45,900	0.1
			7.8	26.8	46,000	0.1
			10.0*	26.7	46,100	0.1
A10	15 Jun 78	0400	Surface	29.1	29,800	7.0
			2.5	29.1	30,000	7.0
			5.0	28.9	33,500	6.3
			7.0	27.4	44,700	0.1
			9.0	26.8	46,200	0.1
			11.3*	26.8	46,200	0.2

Table A2 (cont'd)

Station	Date	Time	Depth (m)	Temperature (°C)	Conductivity (μmho/cm)	Dissolved Oxygen** (mg/ℓ)
A14	14 Jun 78	2100	Surface	29.8	29,300	7.3
			2.5	29.8	30,100	7.3
			5.0	29.2	30,800	7.0
			5.5	28.2	33,700	4.0
			6.5	27.3	45,800	0.3
			8.0	27.0	46,000	0.2
			9.8*	26.9	46,000	0.3
B2	17 Jun 78	0330	Surface	29.4	44,300	6.3
			3.0	29.4	44,400	6.2
			6.0	28.9	49,000	4.6
			9.0	27.9	49,600	4.1
			12.7*	27.2	49,000	4.4
B6	17 Jun 78	0130	Surface	28.9	44,400	4.3
			3.5	28.8	45,000	3.6
			5.0	28.7	46,000	2.5
			7.3*	28.4	47,300	2.6
B8	17 Jun 78	0030	Surface	29.3	44,400	6.0
			3.0	29.3	44,600	4.8
			5.0	28.8	45,300	5.2
			7.0	28.7	47,700	4.0
			8.6*	28.1	48,600	3.6

Table A2 (cont'd)

Station	Date	Time	Depth (m)	Temperature (°C)	Conductivity (μmho/cm)	Dissolved Oxygen** (mg/ℓ)
B10	16 Jun 78	2315	Surface	29.4	45,300	6.1
			3.0	29.4	45,300	6.1
			5.3	29.3	47,100	5.3
			8.0	29.0	47,600	5.1
			10.9*	28.6	48,000	5.2
B14	16 Jun 78	2135	Surface	29.6	45,400	5.7
			3.0	29.6	46,900	5.6
			5.0	29.6	46,900	5.6
			6.5*	29.6	46,800	5.7

*denotes bottom
**corrected for conductivity

Table A3. Hydrographic data from the fall collection trip (September 1978).

Station	Date	Time	Depth (m)	Temperature (°C)	Conductivity (μmhos/cm)	Dissolved Oxygen (mg/l)
A2	23 Sep 78	2009	Surface	28.6	42,300	9.31
			5.5	28.6	44,000	8.30
			11.0*	28.3	46,400	6.97
A6	23 Sep 78	2154	Surface	28.2	36,100	7.62
			4.4	28.5	41,500	7.17
			9.3*	28.5	42,400	8.42
A8	23 Sep 78	2251	Surface	28.3	40,200	8.01
			5.6	28.6	44,000	7.75
			11.0*	28.4	45,600	7.46
A10	23 Sep 78	2340	Surface	28.4	46,800	7.56
			6.0	28.5	46,800	7.73
			12.6*	28.4	47,200	8.05
A14	24 Sep 78	0119	Surface	28.3	45,700	7.66
			5.0	28.4	45,600	7.43
			11.0*	28.3	47,400	7.44
B2	24 Sep 78	2007	Surface	28.8	48,200	7.28
			4.3	28.9	48,600	7.23
			9.4*	28.7	49,300	7.29
B6	24 Sep 78	2142	Surface	28.7	48,500	7.39
			3.5	28.6	48,000	7.40
			7.0*	28.6	48,800	7.85

Table A3 (cont'd).

Station	Date	Time	Depth (m)	Temperature (°C)	Conductivity (μmhos/cm)	Dissolved Oxygen (mg/l)
B8	25 Sep 78	0133	Surface	28.5	49,500	7.23
			4.5	28.5	49,500	7.36
			9.4*	28.5	49,600	7.53
B10	25 Sep 78	0038	Surface	28.8	49,400	7.14
			6.0	28.8	49,100	7.03
			11.8*	28.8	48,900	7.62
B14	24 Sep 78	2311	Surface	28.9	46,100	7.54
			4.0	28.9	48,000	7.64
			8.0*	28.9	48,300	7.75

*denotes bottom reading

Table A4. Hydrographic data from the winter collection trip (January 1979).

Station	Date	Time	Depth (m)	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/l)
A2	12 Jan 79	1900	Surface	9.1	45,000	11.18
			5.6	9.8	45,500	10.59
			10.4*	9.8	45,600	11.00
A6	12 Jan 79	2140	Surface	8.6	43,600	10.71
			4.8	9.7	45,400	10.88
			8.2*	9.5	45,200	11.30
A8	12 Jan 79	2040	Surface	8.9	42,000	10.82
			5.4	9.8	45,200	10.86
			9.7*	9.6	45,400	12.15
A10	12 Jan 79	2250	Surface	9.1	42,700	11.03
			5.4	10.1	45,300	10.59
			11.2*	10.3	45,500	12.06
A14	13 Jan 79	0010	Surface	8.5	42,200	10.40
			4.5	8.8	44,800	10.54
			9.7*	9.4	45,200	10.60
B2	11 Jan 79	0345	Surface	11.3	43,000	10.25
			4.7	11.5	43,000	10.19
			9.2*	11.6	43,600	10.45

Table A4 (cont'd)

Station	Date	Time	Depth (m)	Temperature (°C)	Conductivity (μmhos/cm)	Dissolved Oxygen (mg/l)
B6	11 Jan 79	2300	Surface	12.0	45,100	10.80
			4.9	12.1	45,500	10.89
			8.3*	12.2	45,900	11.24
B8	11 Jan 79	2135	Surface	12.9	47,700	10.27
			6.2	12.9	48,100	10.04
			9.5*	12.8	48,100	11.54
B10	12 Jan 79	0010	Surface	12.5	48,200	10.22
			6.6	12.6	48,200	10.98
			12.0*	12.6	48,100	11.63
B14	12 Jan 79	0200	Surface	12.3	48,400	10.03
			4.8	12.3	48,900	10.00
			8.7*	12.3	48,600	11.33

*denotes bottom reading

Table A5. Weather data from the spring collection trip (April 1979).

Station	Date	Time	Air Temperature (C)	Wind Speed (mph)	Direction	Sea Height (ft.)	Direction	Current Strength	Direction	Sky
A-2	5 Apr 79	2340		6	SSE	0				
A-6	6 Apr 79	0100		3	S	0				
A-8	5 Apr 79	2210		8	SSE	0				
A-10	5 Apr 79	2115		0		0				
A-14	6 Apr 79	0240		0		0				
B-2	4 Apr 79	1940		12-14	N	1-3	N			
B-6	4 Apr 79	2130		18	NNE	1-2	N			
B-8	4 Apr 79	2240		18	NE	1-3	NE			
B-10	4 Apr 79	2330		20	NNW	1-3	N	Strong	S	
B-14	5 Apr 79	0110		24	NNE	2-3	N	Moderate	N	

Table A6. Weather data from the summer collection trip (June 1978).

Station	Date	Time	Air Temperature (C)	Wind Speed (mph)	Direction	Sea Height (ft)	Direction	Current Strength	(From) Direction	Sky
A2	15 June 78	0211	-	-	-	2-4	-	-	-	Clear
A6	14 June 78	2352	-	10-16	-	2-4	-	-	-	Clear
A8	14 June 78	2242	-	10	-	2-4	-	-	-	Clear
A10	15 June 78	0409	-	-	-	2-4	-	-	-	Clear
A14	14 June 78	2111	-	8-10	-	2-3	-	-	-	Clear
B2	17 June 78	0341	-	9-10	-	3-5	-	-	-	Pt.Cloudy
B6	17 June 78	0149	-	12-16	-	3-5	-	-	-	Pt.Cloudy
B8	17 June 78	0042	-	8-14	-	2-4	-	-	-	Pt.Cloudy
B10	16 June 78	2327	-	6-10	-	2-4	-	-	-	Pt.Cloudy
B14	16 June 78	2143	-	-	-	2-4	-	-	-	Pt.Cloudy

Table A7. Weather data from the fall collection trip (September 1978).

Station	Date	Time	Air Temperature (C)	Wind Speed (mph)	Direction	Sea Height (ft)	Direction	Current Strength	(From) Direction	Sky
A2	23 Sep 78	2009	24.6	6-9	NE	1-3	NE	Strong	NE	Overcast
A6	23 Sep 78	2154	24.8	6-9	ESE	1-3	NE	Strong	NE	Overcast
A8	23 Sep 78	2251	-	8-12	NNE	1-3	NNE	Slight	N	Overcast
A10	23 Sep 78	2340	25.1	8-14	NNE	2-4	NNE	Moderate	N	Overcast
A14	24 Sep 78	0119	24.2	12	NNE	1-3	NNE	Strong	N	Overcast
B2	24 Sep 78	2007	25.5	8-12	NNE	2-4	N	None	-	Hazy
B6	24 Sep 78	2142	25.0	12-20	NNE	2-4	NNE	Moderate	NE	Hazy
B8	25 Sep 78	0133	23.3	12-18	NNE	3-5	NNE	Moderate	NNW	Clear
B10	25 Sep 78	0038	23.9	14	NNE	3-5	N	Very Strong	NNW	Clear
B14	24 Sep 78	2311	24.4	10-15	NNE	2-4	N	Very Strong	NNE	Clear

Table A8. Weather data from the winter collection trip (January 1979).

Station	Date	Time	Air Temperature (°C)	Wind Speed (mph)	Direction	Sea Height (ft)	Direction	Current Strength	(From) Direction	Sky
A2	12 Jan 79	1900	-	12	SSW	0-2	SW	None		Clear
A6	12 Jan 79	2140	-	3	WSW	0-2	SW	None		Clear
A8	12 Jan 79	2040	-	8	SW	0-2	SW	None		Clear
A10	12 Jan 79	2250	-	7	SE	0-2	SE	None		Clear
A14	13 Jan 79	0010	-	8	SSW	0-2	SW	None		Clear
B2	11 Jan 79	0345	-	35	ESE	3-5	E	Strong	-	Cloudy
B6	11 Jan 79	2300	-	17	NNE	1-3	NNE	None		Clear
B8	11 Jan 79	2135	-	26	NE	4-6	NE	None		Clear
B10	12 Jan 79	0010	-	22	NE	2-4	NE	None		Clear
B14	12 Jan 79	0200	-	26	NNE	2-4	NNE	None		Clear

Table A9. Summary table of mean standard displacement volumes (ml/100 m^3).

SITE A WEST HACKBERRY					SITE B WEEKS ISLAND				
		Bongo Net Mesh Size					Bongo Net Mesh Size		
Station	Season	0.333 mm	0.505 mm	n	Station	Season	0.333 mm	0.505 mm	n
2	Sp	3831	324	3	2	Sp	1822	235	3
	S	2290	1081	3		S	8521	6017	3
	F	312	366	3		F	2403	1320	3
	W	6980	814	3		W	2190	1176	3
	Mean	3353	646	12		Mean	3734	2197	12
6	Sp	1683	220	3	6	Sp	3384	1125	3
	S	1521	588	3		S	4671	2014	3
	F	569	474	3		F	2880	993	3
	W	1850	270	3		W	9881	2611	3
	Mean	1405	388	12		Mean	5204	1686	12
8	Sp	8036	150	3	8	Sp	5723	2078	3
	S	2943	858	3		S	7175	4302	3
	F	1325	767	3		F	2199	1085	3
	W	8439	1433	3		W	8410	7974	3
	Mean	5186	802	12		Mean	5877	3860	12
10	Sp	5638	178	3	10	Sp	9702	6554	3
	S	2262	1261	3		S	6203	2794	3
	F	394	436	3		F	4467	1453	3
	W	3520	869	3		W	3700	303	3
	Mean	2953	686	12		Mean	6018	2776	12
14	Sp	5148	81	3	14	Sp	8484	1764	3
	S	4085	1519	3		S	4083	2594	3
	F	2748	822	3		F	4227	1066	3
	W	2721	741	3		W	4093	712	3
	Mean	3676	791	12		Mean	5324	1534	12
Mean	Sp	4867	191	15	Mean	Sp	5823	2351	15
	S	2620	1062	15		S	6131	3544	15
	F	1096	573	15		F	3235	1184	15
	W	4702	825	15		W	5767	2555	15
	Mean	3315	663	60		Mean	5230	2408	60

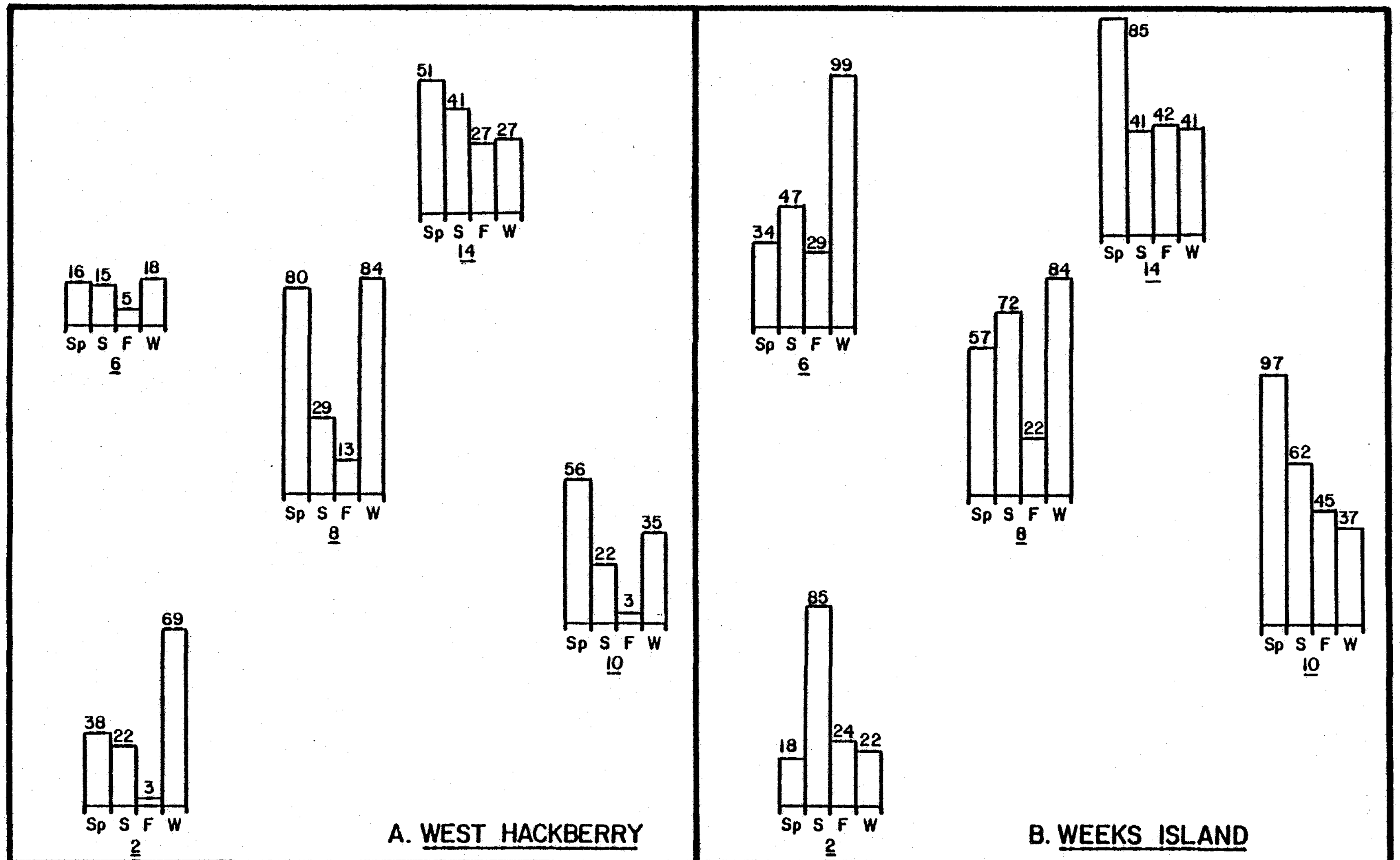

Fig. A1. Mean standard displacement volumes.

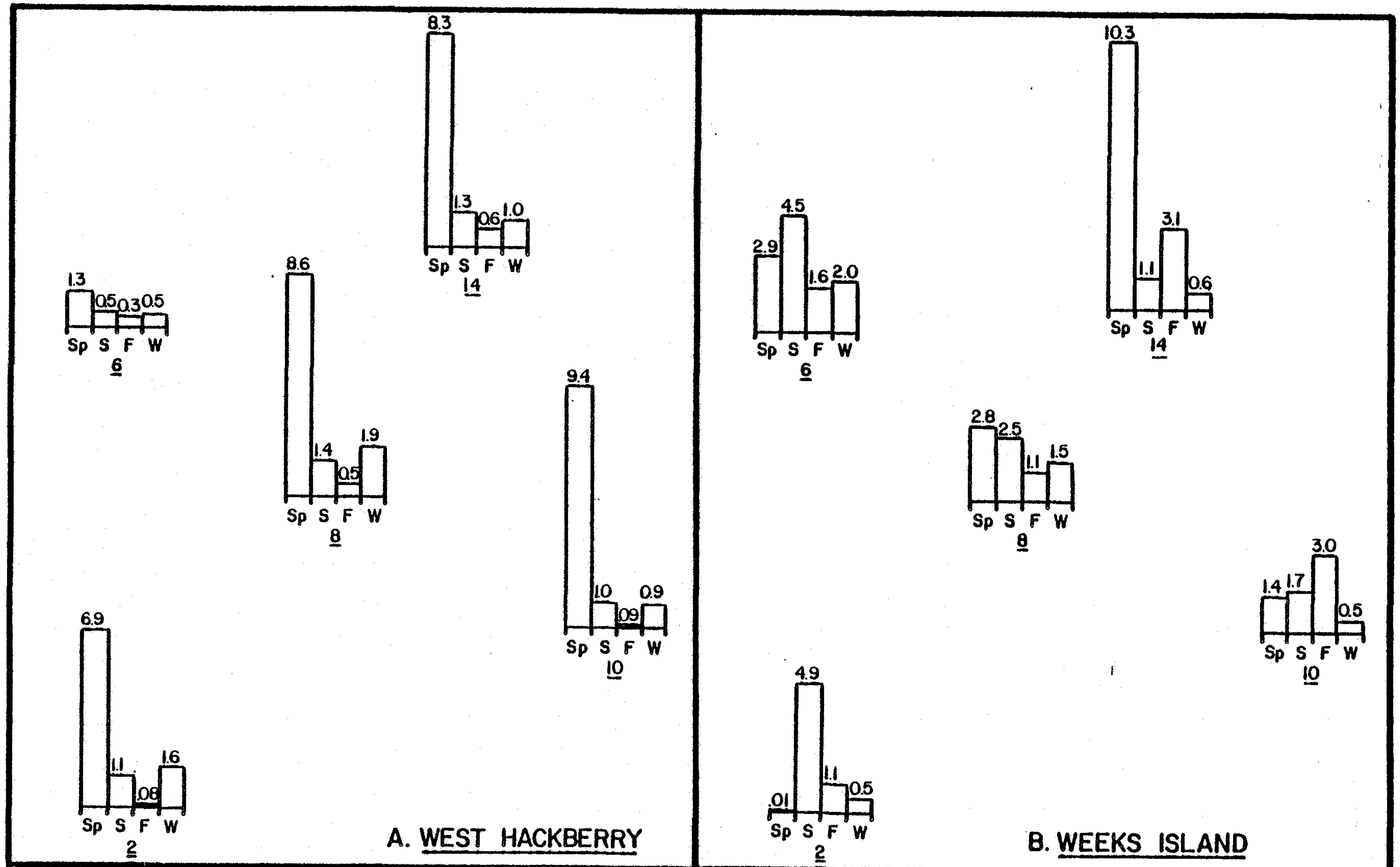

Fig. A2. Mean density of invertebrates collected in the 0.333 mm mesh bongo net.

Table A10. Summary table of mean densities of invertebrates collected in the bongo nets (individuals/m^3).

SITE A WEST HACKBERRY				
		Bongo Net Mesh Size		
Station	Season	0.333 mm	0.505 mm	n
2	Sp	6908	18	3
	S	1144	171	3
	F	86	24	3
	W	1589	56	3
	Mean	2432	68	12
6	Sp	1256	16	3
	S	546	22	3
	F	328	55	3
	W	504	15	3
	Mean	658	27	12
8	Sp	8610	38	3
	S	1350	96	3
	F	476	76	3
	W	1855	93	3
	Mean	3073	76	12
10	Sp	9354	52	3
	S	980	149	3
	F	87	36	3
	W	889	49	3
	Mean	2827	71	12
14	Sp	8281	12	3
	S	1292	269	3
	F	650	158	3
	W	1018	27	3
	Mean	2810	116	12
Mean	Sp	6882	27	15
	S	1062	141	15
	F	325	70	15
	W	1171	48	15
	Mean	2360	72	60

SITE B WEEKS ISLAND				
		Bongo Net Mesh Size		
Station	Season	0.333 mm	0.505 mm	n
2	Sp	15	23	3
	S	4925	396	3
	F	1141	179	3
	W	465	76	3
	Mean	1636	169	12
6	Sp	2963	86	3
	S	4496	335	3
	F	1632	127	3
	W	1962	293	3
	Mean	2763	210	12
8	Sp	2836	165	3
	S	2519	494	3
	F	1081	180	3
	W	1474	859	3
	Mean	1977	425	12
10	Sp	1388	232	3
	S	1663	439	3
	F	2970	209	3
	W	493	18	3
	Mean	1628	225	12
14	Sp	10396	147	3
	S	1148	286	3
	F	3140	161	3
	W	591	39	3
	Mean	4112	158	12
Mean	Sp	3520	130	15
	S	2950	390	15
	F	1993	172	15
	W	1026	257	15
	Mean	2395	237	60

Table A11. Mean density of fish collected in the bongo nets (individuals/100 m^3).

SITE A WEST HACKBERRY					SITE B WEEKS ISLAND				
		Bongo Net Mesh Size					Bongo Net Mesh Size		
Station	Season	0.333 mm	0.505 mm	n	Station	Season	0.333 mm	0.505 mm	n
2	Sp	752	849	3	2	Sp	1026	474	3
	S	2458	870	3		S	340	289	3
	F	16	16	3		F	165	293	3
	W	22	5	3		W	38	39	3
	Mean	812	435	12		Mean	392	274	12
6	Sp	1434	1758	3	6	Sp	280	260	3
	S	277	171	3		S	376	329	3
	F	27	33	3		F	269	274	3
	W	7	1	3		W	191	64	3
	Mean	436	491	12		Mean	279	232	12
8	Sp	1697	1416	3	8	Sp	505	760	3
	S	2098	2467	3		S	414	456	3
	F	16	19	3		F	525	513	3
	W	8	3	3		W	114	131	3
	Mean	954	976	12		Mean	389	465	12
10	Sp	1047	1018	3	10	Sp	760	736	3
	S	830	455	3		S	605	431	3
	F	1675	1789	3		F	246	200	3
	W	16	1	3		W	37	3	3
	Mean	892	816	12		Mean	412	342	12
14	Sp	591	641	3	14	Sp	2460	2140	3
	S	548	388	3		S	621	597	3
	F	68	81	3		F	335	302	3
	W	11	-	3		W	58	31	3
	Mean	304	277	12		Mean	942	768	12
Mean	Sp	1104	1136	15	Mean	Sp	1006	874	15
	S	1242	870	15		S	471	420	15
	F	360	387	15		F	308	316	15
	W	13	2	15		W	90	54	15
	Mean	680	599	60		Mean	475	416	60

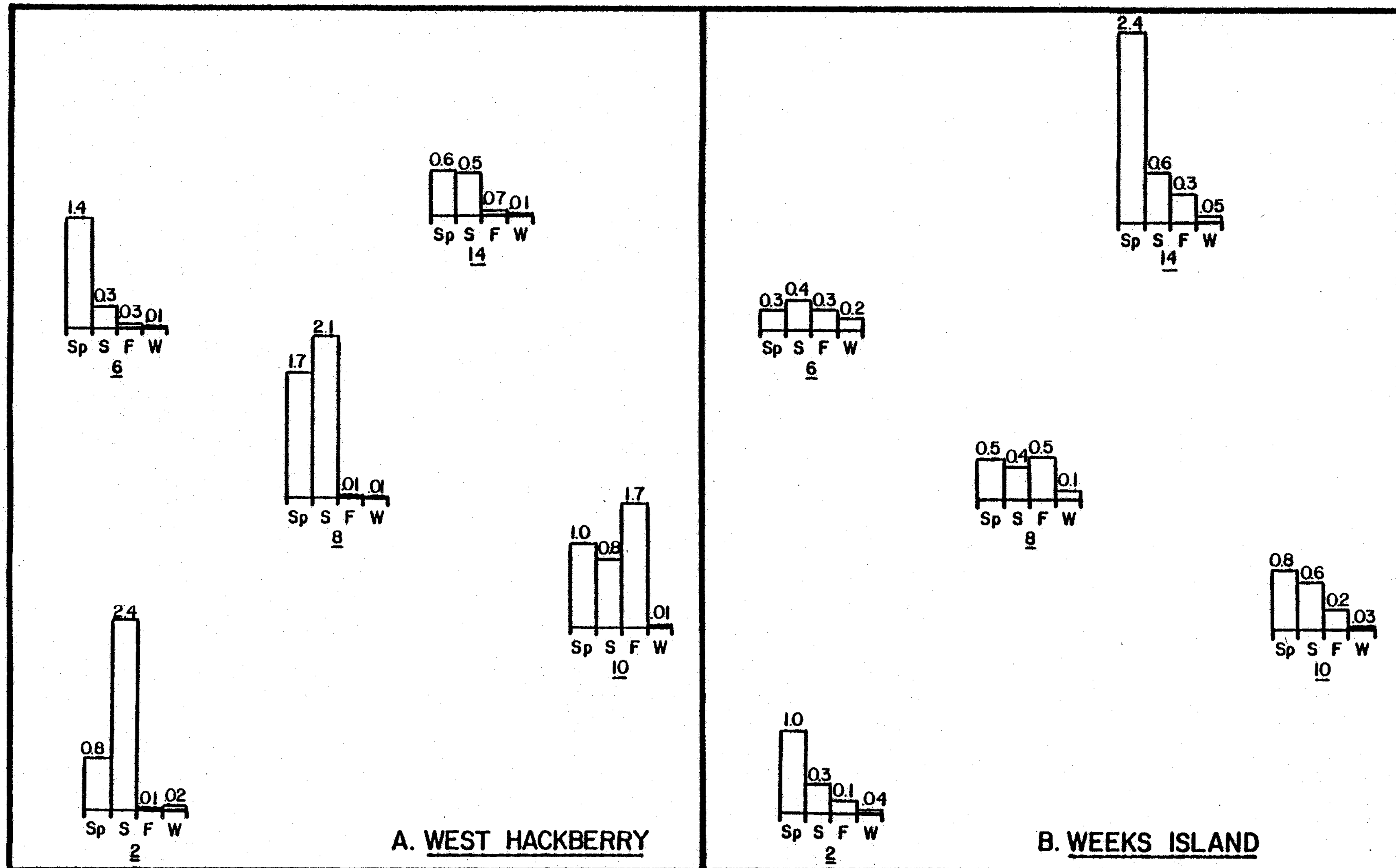

Fig. A3. Mean density of fish collected in the 0.333 mm mesh bongo net.

Table A12. Diversity indices of invertebrate collections from the 0.333 and 0.505 mm mesh bongo nets.

SITE A WEST HACKBERRY					SITE B WEEKS ISLAND				
		Bongo Net Mesh Size					Bongo Net Mesh Size		
Station	Season	0.333 mm	0.505 mm	n	Station	Season	0.333 mm	0.505 mm	n
2	Sp	0.109	1.013	3	2	Sp	1.026	1.687	3
	S	0.945	1.656	3		S	1.338	2.317	3
	F	1.806	1.866	3		F	1.014	2.206	3
	W	1.142	1.301	3		W	1.477	1.285	3
	Mean	1.001	1.459	12		Mean	1.214	1.874	12
6	Sp	0.316	1.046	3	6	Sp	0.282	1.541	3
	S	0.633	1.663	3		S	1.011	2.245	3
	F	1.466	1.747	3		F	0.772	2.404	3
	W	0.943	1.046	3		W	1.482	1.362	3
	Mean	0.840	1.376	12		Mean	0.887	1.888	12
8	Sp	0.124	0.550	3	8	Sp	0.572	1.463	3
	S	0.864	1.828	3		S	1.526	2.221	3
	F	1.336	1.793	3		F	1.336	2.378	3
	W	1.110	1.323	3		W	1.304	0.835	3
	Mean	0.859	1.374	12		Mean	1.185	1.725	12
10	Sp	0.218	0.890	3	10	Sp	0.997	0.807	3
	S	1.148	1.678	3		S	2.031	2.197	3
	F	1.778	1.572	3		F	0.794	2.116	3
	W	1.236	1.292	3		W	1.622	1.531	3
	Mean	1.095	1.358	12		Mean	1.361	1.663	12
14	Sp	0.167	1.164	3	14	Sp	0.225	1.490	3
	S	0.698	1.458	3		S	2.230	2.435	3
	F	1.610	1.952	3		F	0.581	2.183	3
	W	0.586	1.157	3		W	2.011	1.745	3
	Mean	0.765	1.433	12		Mean	1.194	1.963	12
Mean	Sp	0.187	0.933	15	Mean	Sp	0.620	1.398	15
	S	0.858	1.657	15		S	1.627	2.283	15
	F	1.599	1.786	15		F	0.900	2.258	15
	W	1.004	1.224	15		W	1.548	1.352	15
	Mean	0.912	1.400	60		Mean	1.168	1.823	60

Table A13. Diversity indices of fish collections from the 0.333 and 0.505 mm mesh bongo nets.

SITE A WEST HACKBERRY					SITE B WEEKS ISLAND				
		Bongo Net Mesh Size					Bongo Net Mesh Size		
Station	Season	0.333 mm	0.505 mm	n	Station	Season	0.333 mm	0.505 mm	n
2	Sp	1.13	1.02	3	2	Sp	0.76	0.80	3
	S	1.69	1.58	3		S	2.00	2.06	3
	F	0.53	0.96	3		F	2.01	2.07	3
	W	0.72	0.58	3		W	0.84	1.52	3
	Mean	1.02	1.03	12		Mean	1.40	1.61	12
6	Sp	1.35	1.20	3	6	Sp	1.89	1.68	3
	S	1.34	1.46	3		S	1.70	1.65	3
	F	0.87	1.08	3		F	2.01	2.01	3
	W	0.60	-	3		W	1.14	0.78	3
	Mean	1.04	0.94	12		Mean	1.68	1.53	12
8	Sp	0.94	0.86	3	8	Sp	1.30	1.19	3
	S	1.30	0.86	3		S	1.89	1.91	3
	F	0.22	0.55	3		F	1.48	1.21	3
	W	0.23	-	3		W	1.56	1.26	3
	Mean	0.67	0.57	12		Mean	1.56	1.39	12
10	Sp	0.58	0.56	3	10	Sp	1.18	1.10	3
	S	1.94	2.08	3		S	1.64	1.83	3
	F	0.05	0.05	3		F	2.24	2.21	3
	W	0.68	-	3		W	1.30	0.35	3
	Mean	0.81	0.67	12		Mean	1.59	1.37	12
14	Sp	0.44	0.28	3	14	Sp	1.40	1.34	3
	S	1.97	1.99	3		S	1.67	1.68	3
	F	1.43	1.12	3		F	1.95	1.84	3
	W	0.21	-	3		W	0.87	0.75	3
	Mean	1.01	0.85	12		Mean	1.53	1.40	12
Mean	Sp	0.89	0.78	15	Mean	Sp	1.30	1.22	15
	S	1.65	1.60	15		S	1.78	1.82	15
	F	0.62	0.75	15		F	1.94	1.87	15
	W	0.49	0.12	15		W	1.16	0.93	15
	Mean	0.91	0.81	60		Mean	1.55	1.46	60

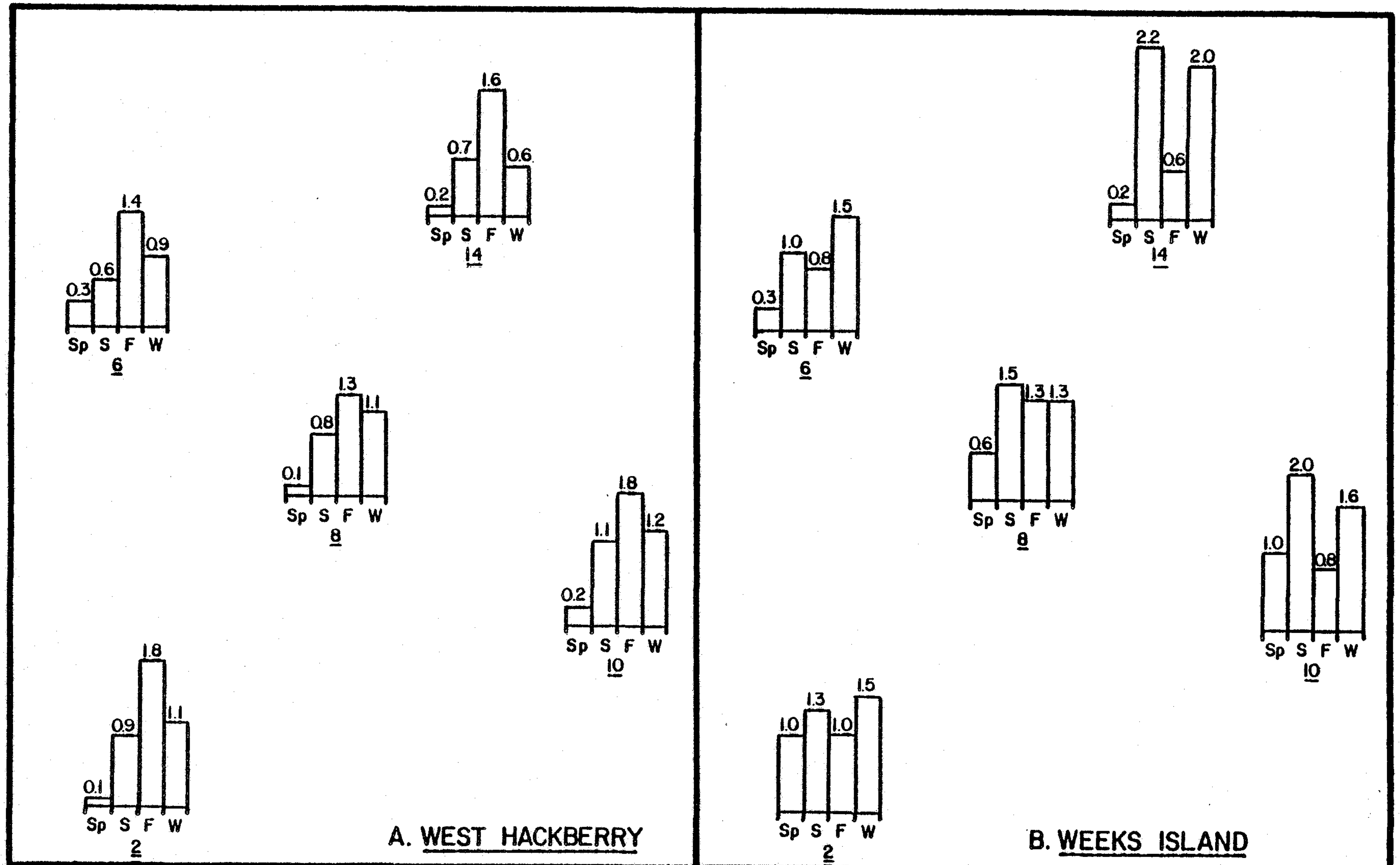

Fig. A4. Diversity indices of invertebrate collections from the 0.333 mm mesh bongo net.

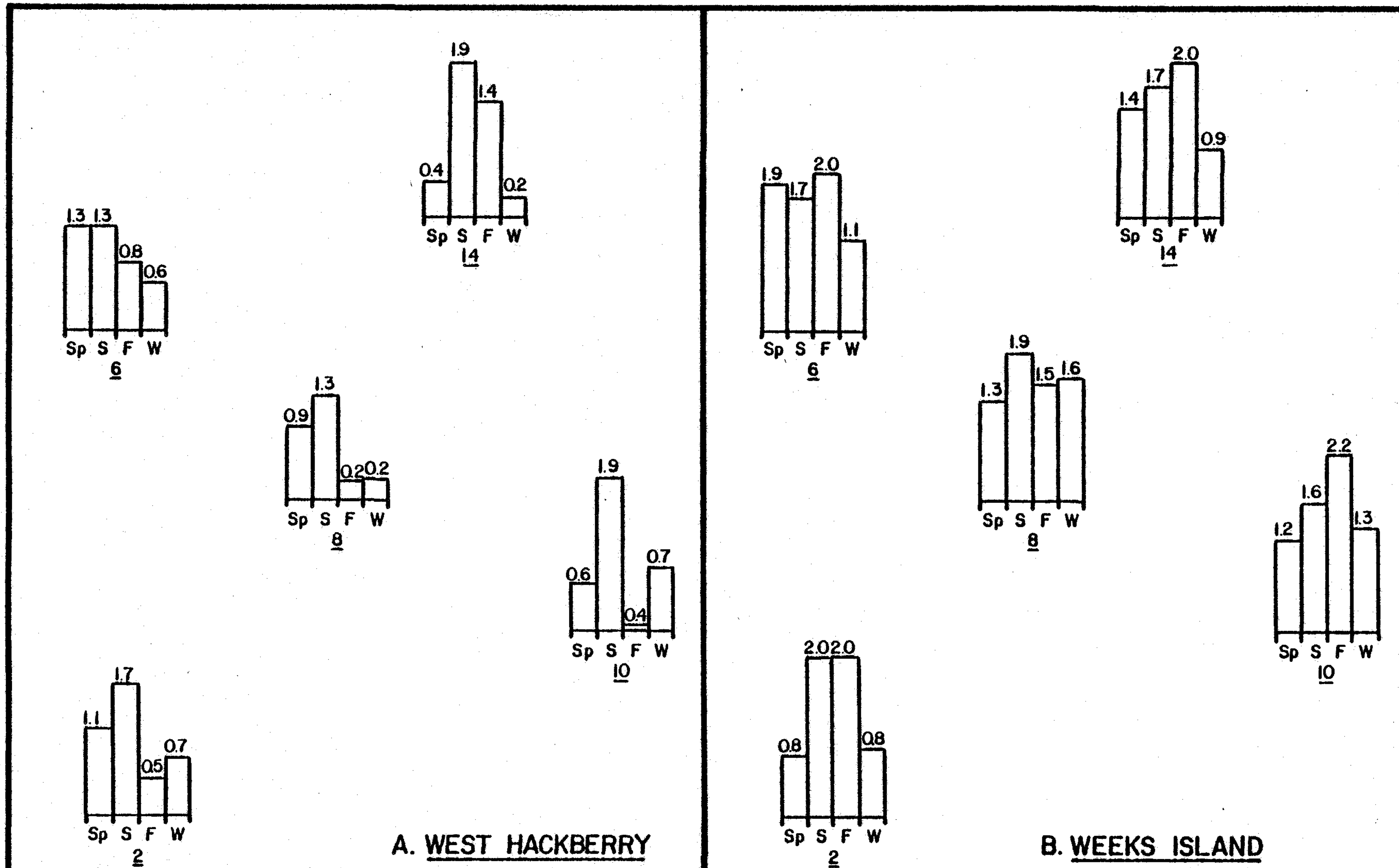

Fig. A5. Diversity indices of fish collections from the 0.333 mm mesh bongo net.

Table A14. Richness and evenness indices for invertebrate collections from 0.333 and 0.505 mm mesh bongo net.

Site	Station	Season	Richness 0.333	Richness 0.505	Evenness 0.333	Evenness 0.505
A	2	Mean	1.15	1.55	0.37	0.56
	6	"	0.95	1.52	0.38	0.55
	8	"	1.05	1.56	0.33	0.51
	10	"	1.29	1.51	0.40	0.51
	14	"	1.15	1.67	0.28	0.53
B	2	"	1.93	2.28	0.41	0.62
	6	"	1.88	2.27	0.28	0.62
	8	"	1.94	2.30	0.38	0.54
	10	"	1.83	2.02	0.44	0.55
	14	"	1.91	2.34	0.36	0.64
A	Mean	Spring	0.29	1.08	0.15	0.43
		Summer	1.35	1.58	0.31	0.61
		Fall	1.98	2.36	0.53	0.59
		Winter	0.85	1.23	0.42	0.51
B	Mean	Spring	0.98	1.23	0.25	0.56
		Summer	2.87	3.16	0.45	0.65
		Fall	2.24	3.03	0.27	0.66
		Winter	1.48	1.55	0.54	0.52
A	Mean	Mean	1.12	1.56	0.35	0.53
B	Mean	Mean	1.90	2.24	0.38	0.60

Table A15. Richness and evenness indices for fish collections from 0.333 and 0.505 mm mesh bongo net.

Site	Station	Season	Richness 0.333	Richness 0.505	Evenness 0.333	Evenness 0.505
A	2	Mean	0.91	0.85	0.55	0.71
	6	"	0.79	0.75	0.66	0.58
	8	"	0.70	0.73	0.40	0.34
	10	"	0.83	0.75	0.43	0.29
	14	"	0.94	0.79	0.55	0.43
B	2	"	1.41	1.40	0.70	0.80
	6	"	1.41	1.34	0.78	0.78
	8	"	1.63	1.49	0.68	0.64
	10	"	1.53	1.42	0.74	0.61
	14	"	1.52	1.47	0.68	0.70
A	Mean	Spring	1.06	0.94	0.41	0.38
	"	Summer	1.41	1.48	0.71	0.71
	"	Fall	0.50	0.58	0.42	0.66
	"	Winter	0.35	0.10	0.52	0.13
B	Mean	Spring	1.20	1.14	0.60	0.59
	"	Summer	1.80	1.77	0.72	0.75
	"	Fall	2.06	2.12	0.78	0.74
	"	Winter	0.89	0.66	0.78	0.74
A	Mean	Mean	0.83	0.77	0.52	0.47
B	Mean	Mean	1.50	1.42	0.72	0.70

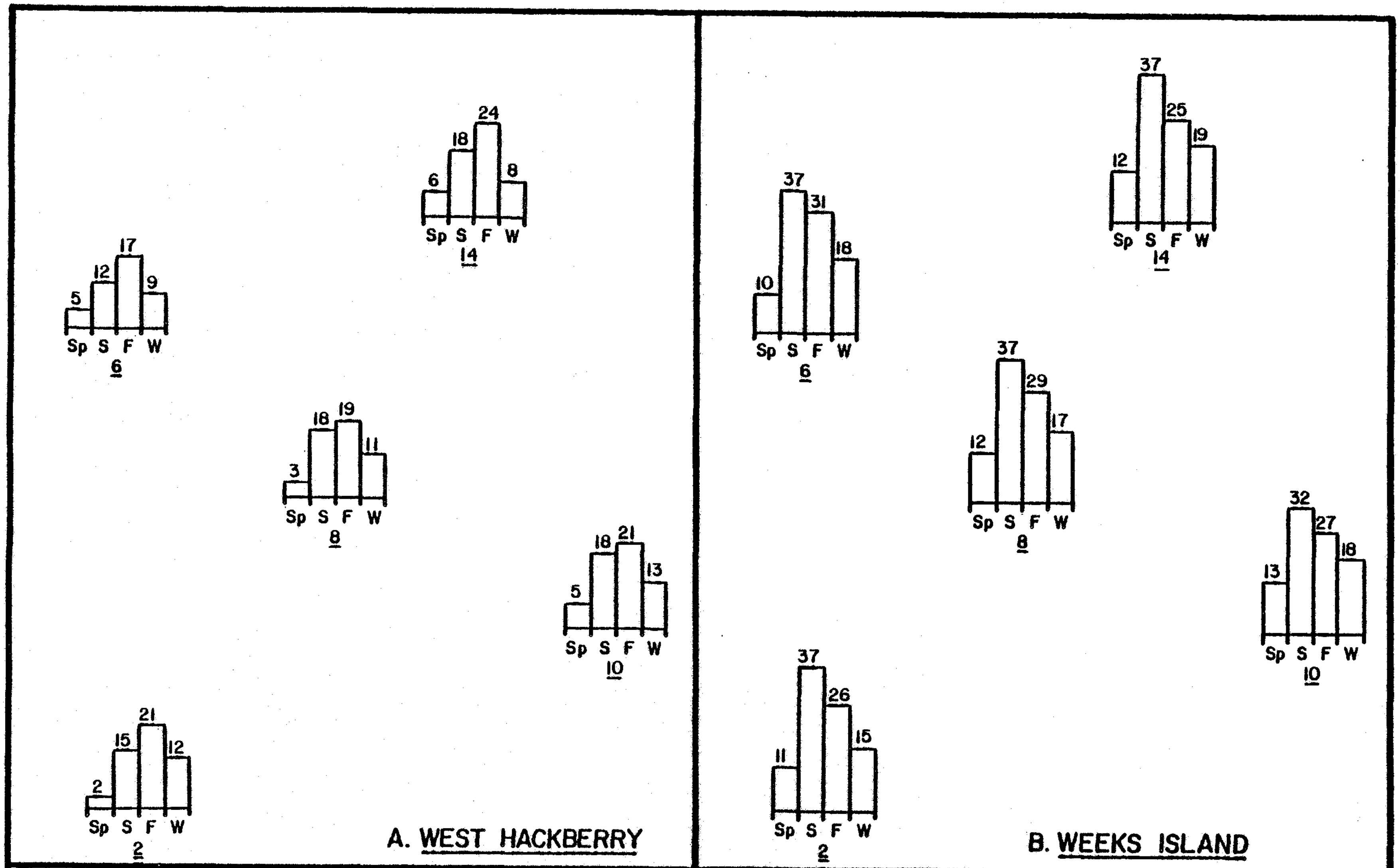

Fig. A6. Number of invertebrate taxa collected at each station.

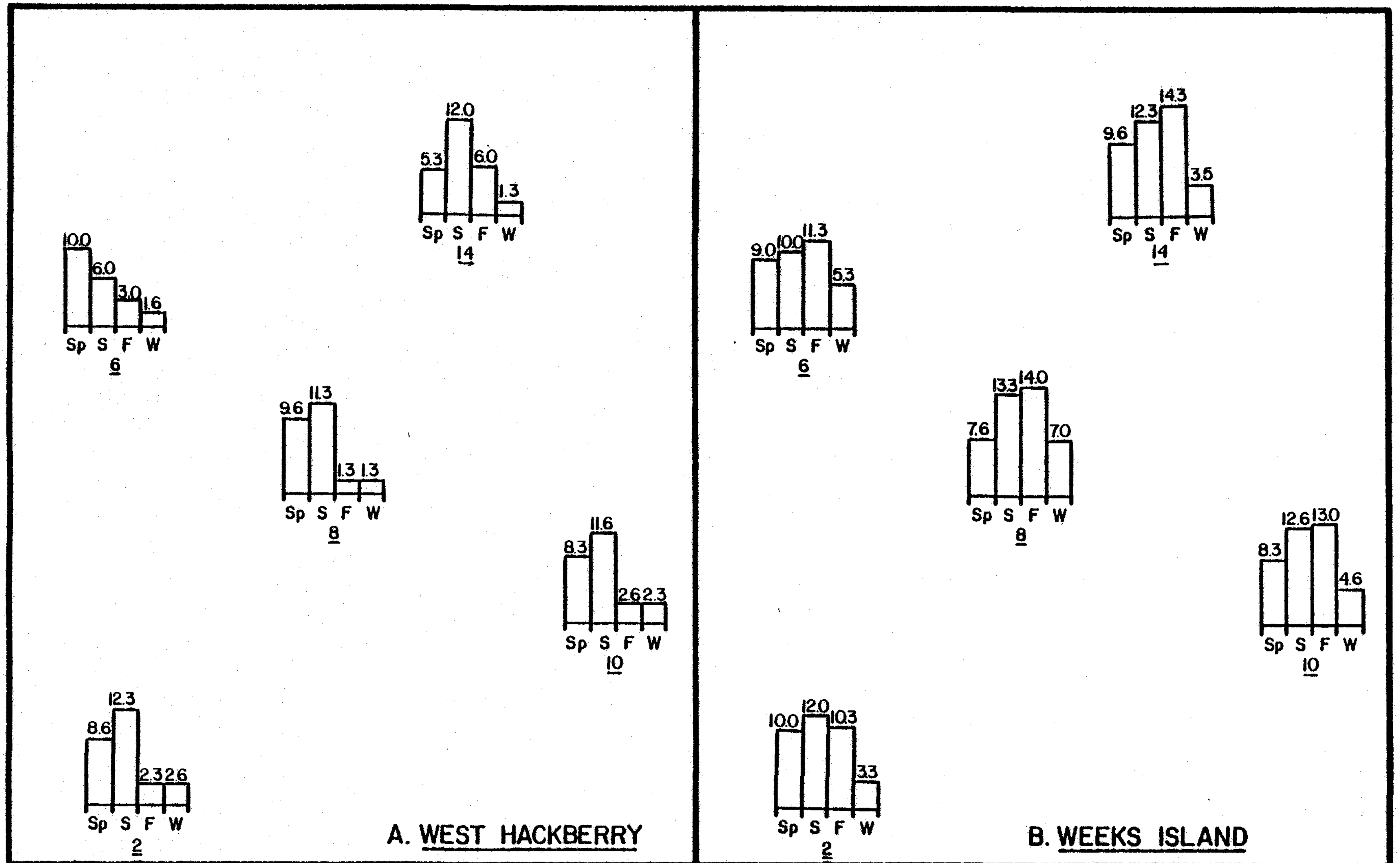

Fig. A7. Number of fish taxa collected at each station.

Table A16. Dominant invertebrate taxa for the spring collections in the 0.333 mm mesh bongo net.

WEST HACKBERRY			WEEKS ISLAND		
Taxon	% Total Density	Mean Density (No/100 m^3)	Taxon	% Total Density	Mean Density (No/100 m^3)
Acartia tonsa	96.1	661,552	*Acartia tonsa*	91.2	351,618
Copepods (Unidentified)	2.8	19,365	*Sagitta* sp.	2.5	9,785
Labidocera sp.	0.2	1,303	Copepods (Unidentified)	2.4	9,238
Sagitta sp.	-	417	*Temora* sp.	1.3	5,092
Cladocerans	-	256	*Labidocera* sp.	0.8	3,145
Polychaetes (Unidentified)	-	225	Crab zoea (Unidentified)	0.7	2,717
Temora sp.	-	208	*Lucifer faxoni*	0.2	856
Crab zoea (Porcellanid)	-	208	Cladocerans	0.1	458
Sergestid postlarvae	-	15	*Sucalanus* sp.	-	148
Mysidopsis bigelowi	-	3	Gastropod meroplankton	-	105
SITE TOTAL	>99.0	688,172		>99.0	385,478

Table A17. Dominant fish taxa for the spring collections in the 0.333 mm mesh bongo net.

Taxon	WEST HACKBERRY % Total Density	WEST HACKBERRY Mean Density (No/100 m^3)	WEEKS ISLAND % Total Density	WEEKS ISLAND Mean Density (No/100 m^3)
Clupeidae (Herrings)	25.1	62	2.2	9
Brevoortia sp.	8.5	21	0.2	1
Unidentified	16.6	41	2.0	8
Engraulidae (Anchovies)	55.1	136	80.0	322
Anchoa hepsetus	6.9	17	3.2	13
Anchoa mitchilli	24.7	61	43.7	176
Anchoa sp.	-	-	2.2	9
Unidentified	23.5	58	30.8	124
Sparidae (Porgies)	4.4	11	3.5	14
Unidentified	4.4	11	3.5	14
Sciaenidae (Drums)	15.4	38	13.4	54
Cynoscion ? arenarius	10.1	25	3.0	12
Cynoscion sp.	-	<1	3.2	13
Pogonias cromis	1.2	3	0.2	1
Unidentified	4.0	10	6.9	28
Gobiidae (Gobies)	-	-	1.0	4
?Microgobius sp.	-	-	1.0	4
TOTAL	>99.0	247	>99.0	403
Unidentified Fish		851		594
Total of All Fish		1,104		1,006

Table A18. Dominant invertebrate taxa for the summer collections in the 0.333 mm mesh bongo net.

WEST HACKBERRY			WEEKS ISLAND		
Taxon	% Total Density	Mean Density (No/100 m^3)	Taxon	% Total Density	Mean Density (No/100 m^3)
Acartia tonsa	77.7	82,535	Cladocerans	62.4	184,208
Labidocera sp.	11.6	12,294	*Temora* sp.	7.3	21,622
Oikopleura sp.	2.7	2,856	Polychaete "D"	5.2	15,310
Cladocerans	1.8	1,932	Copepods (Unidentified)	4.3	12,623
Copepods (Unidentified)	1.5	1,568	Coelenterates	4.1	11,989
Crab zoea (Unidentified)	1.4	1,482	*Eucalanus* sp.	2.5	7.425
Coelenterates	1.0	1,080	Crab zoea (Unidentified)	2.0	6,008
Polychaete "D"	0.6	651	*Sagitta* sp.	1.9	5,747
Sagitta sp.	0.3	356	Thallacea	1.9	5,517
Amphipoda (Unidentified)	0.3	348	*Ogyrides* sp. zoea	1.5	4,548
Lucifer faxoni	0.3	299	*Labidocera* sp.	1.1	3,320
SITE TOTAL	>99.0	106,200		>94.0	295,000

Table A19. Dominant fish taxa for the summer collections in the 0.333 mm mesh bongo net.

Taxon	WEST HACKBERRY % Total Density	WEST HACKBERRY Mean Density (No/100 m^3)	WEEKS ISLAND % Total Density	WEEKS ISLAND Mean Density (No/100 m^3)
Clupeida (Herrings)	45.2	420	3.2	14
Opistonema oglinum	2.5	23	0.4	2
Unidentified	42.7	397	2.8	12
Engraulidae (Anchovies)	41.3	384	35.2	153
Anchoa hepsetus	5.9	55	2.1	9
Anchoa sp.	4.6	43	1.4	6
Unidentified	30.8	286	31.8	138
Carangidae (Jacks)	2.9	27	37.2	162
Chloroscombrus chrysurus	1.5	14	9.2	40
Unidentified	1.4	13	28.0	122
Sciaenidae (Drums)	10.5	98	13.3	58
Cynoscion sp.	1.0	9	8.3	36
Cynoscion?Bairdiella sp.	4.3	40	5.0	22
Unidentified	5.3	49	-	<1
Ephippidae (Spadefish)	-	-	3.2	14
Chaetodipterus faber	-	-	3.2	14
Bothidae (Lefteye Flounders)	-	-	2.3	10
Citharichthys sp.	-	-	2.3	10
Cynoglossidae (Tonguefish)	-	-	5.5	24
Symphurus sp.	-	-	5.5	24
TOTAL	>99.0	929	>99.0	435
Unidentified Fish		283		9
Total of All Fish		1,237		465

Table A20. Dominant invertebrate taxa for the fall collections in the 0.333 mm mesh bongo net.

WEST HACKBERRY			WEEKS ISLAND		
Taxon	% Total Density	Mean Density (No/100 m^3)	Taxon	% Total Density	Mean Density (No/100 m^3)
Temora sp.	39.8	12,936	*Temora* sp.	81.6	162,574
Copepods (Unidentified)	26.7	8,673	*Sagitta* sp.	6.1	12,128
Eucalanus sp.	10.0	3,257	Copepods (Unidentified)	5.3	10,580
Sagitta sp.	7.2	2,357	*Eucalanus* sp.	1.6	3,213
Labidocera sp.	6.1	1,981	Crab zoea (Unidentified)	1.0	2,028
Acartia tonsa	2.6	863	Cumaceans	0.6	1,148
Oikopleura sp.	2.3	758	*Creseis* sp.	0.6	1,098
Crab zoea (Unidentified)	0.9	281	Gastropod meroplankton	0.5	1,054
Creseis sp.	0.5	170	*Lucifer faxoni*	0.5	1,047
Ogyrides sp. zoea	0.3	97	*Oikopleura* sp.	0.4	911
SITE TOTAL	>96.0	32,500		>98.0	199,300

Table A21. Dominant fish taxa for the fall collections in the 0.333 mm mesh bongo net.

Taxon	WEST HACKBERRY % Total Density	WEST HACKBERRY Mean Density (No/100 m³)	WEEKS ISLAND % Total Density	WEEKS ISLAND Mean Density (No/100 m³)
Clupeidae (Herrings)	19.0	2.7	28.4	40
Opistonema oglinum	8.4	1.2	11.3	16
Unidentified	-	-	5.7	8
?Unidentified	10.6	1.5	11.3	16
Engraulidae (Anchovies)	11.3	1.6	10.6	15
Anchoa hepsetus	-	-	5.0	7
Anchoa mitchilli	11.3	1.6	-	<1
Engraulis eurystole	-	-	5.7	8
Carangidae (Jacks)	19.7	2.8	28.4	40
Chloroscombrus chrysurus	6.3	0.9	2.8	4
Unidentified	13.4	1.9	25.5	36
Sciaenidae (Drums)	50.0	7.1	32.6	46
Bairdiella sp.	2.1	0.3	5.0	7
Cynoscion sp.	9.2	1.3	10.6	15
Cynoscion ?nebulosus	4.2	0.6	-	<1
Cynoscion ?nothus	14.8	2.1	5.7	8
Menticirrhus ?americanus	4.9	0.7	-	<1
Micropogon undulatus	14.8	2.1	4.2	6
Unidentified	-	-	7.1	10
TOTAL	>99.9	14.2	>99.9	141
Unidentified Fish		342		124
Total of All Fish		360		308

Table A22. Dominant invertebrate taxa for the winter collections in the 0.333 mm mesh bongo net.

WEST HACKBERRY			WEEKS ISLAND		
Taxon	% Total Density	Mean Density (No/100 m^3)	Taxon	% Total Density	Mean Density (No/100 m^3)
Acartia tonsa	58.6	68,640	*Acartia tonsa*	43.8	44,965
Temora sp.	26.3	30,803	*Labidocera* sp.	27.4	28,153
Sagitta sp.	8.6	10,070	*Sagitta* sp.	10.3	10,541
Labidocera sp.	2.0	2,315	*Temora* sp.	6.8	6,990
Copepods (Unidentified)	1.3	1,501	Crab zoea (Unidentified)	5.1	5,221
Crab zoea (Unidentified)	0.3	336	Copepods (Unidentified)	2.4	2,479
Coelenterates	0.1	161	*Eucalanus* sp.	1.3	1,361
Gastropod meroplankton	0.1	150	Coelenterates	0.5	525
Mysidopsis bigelowi	0.1	135	Amphipoda	0.3	274
Eucalanus sp.	-	70	Gastropod meroplankton	0.2	254
SITE TOTAL	>97.0	117,100		>98.0	102,600

Table A23. Dominant fish taxa for the winter collections in the 0.333 mm mesh bongo net.

Taxon	WEST HACKBERRY % Total Density	WEST HACKBERRY Mean Density (No/100 m^3)	WEEKS ISLAND % Total Density	WEEKS ISLAND Mean Density (No/100 m^3)
Opichthidae	-	-	0.7	0.6
Myrophis punctatus	-	-	0.7	0.6
Clupeidae (Herrings)	60.2	7.1	56.1	48.0
Brevoortia sp.	12.7	1.5	9.8	8.4
Unidentified	47.4	5.6	46.3	39.6
Carangidae (Jacks)	-	-	0.5	0.4
Unidentified	-	-	0.5	0.4
Sciaenidae	33.9	4.0	36.2	31.0
Leiostomus xanthurus	5.1	0.6	6.3	5.4
Micropogon undulatus	22.9	2.7	29.3	25.1
Unidentified	5.9	0.7	0.6	0.5
Mugilidae (Mullets)	-	-	0.1	0.1
Mugil cephalus	-	-	0.1	0.1
Gobiidae (Gobies)	4.2	0.5	2.0	1.7
Unidentified	4.2	0.5	2.0	1.7
Bothidae (Lefteye Flounders)	1.7	0.2	4.4	3.8
Citharichthys?Etropus sp.	1.7	0.2	4.4	3.8
TOTAL	>99.0	11.8	>98.0	85.6
Unidentified Fish		0.1		2.1
Total of All Fish		13		90

Table A24. Taxa collected exclusively in the neuston net.

Taxon	Collected From: West Hackberry Sp	West Hackberry S	West Hackberry F	West Hackberry W	Weeks Island Sp	Weeks Island S	Weeks Island F	Weeks Island W
Fish								
Anguiliformes								
Unidentified						X		
Atherinidae								
Membras martinica		X	X					
Carangidae								
Seriola rivoliana						X		
Sparidae								
Lagodon rhomboides	X			X				
Blennidae								
Hypsoblennius hentzi		X						
Trichiuridae								
Trichiurus lepterus			X					
Stromateidae								
Peprilus alepidotus	X							
Triglidae								
Unidentified							X	
Tetraodontidae								
Sphoeroides sp.						X		
Invertebrates								
Mollusca								
?Donax sp.			X					
Arthropoda								
Leptochela sp. postlarvae			X					
Mysidopsis ?bahia		X						

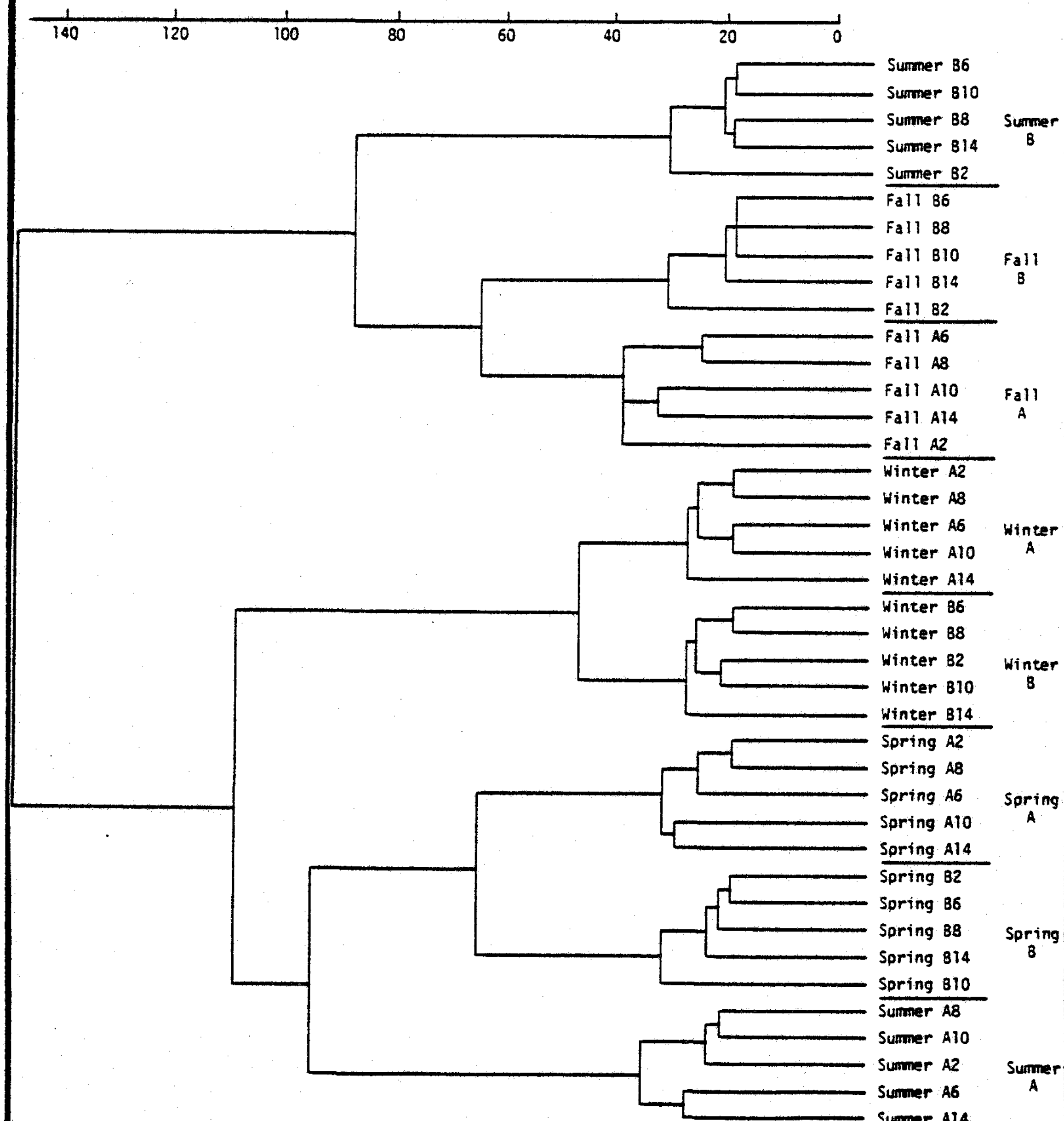

Fig. A8. Bray-Curtis dissimilarity analysis of sites and seasons by taxon presence and abundance for the 0.333 mm mesh bongo net collections.

Table A25. Summary of the two-way table of taxa assemblage associations by site and season for the 0.333 mm mesh bongo net collections.

Taxa Assemblage	WI-All S	WI-All F	WH-All F	WH-All W	WI-All W	WH-All Sp	WI-All Sp	WH-All S
	SITE-SEASON ASSOCIATION							
A	-	--	--	--	--	--	--	-
B	++	-	-	--	-	-	-	+
C	-	-	-	--	--	--	-	+
D	-	+	-	--	--	--	--	--
E	+	+	+	+	++	++	++	++
F	+	-	--	-	-	--	--	--
G	++	++	++	+	+	-	+	++
H	--	-	--	--	--	--	--	--

++ = very strong association

+ = strong association

- = some association

-- = little or no association

WI = Weeks Island

WH = West Hackberry

S = Summer

F = Fall

W = Winter

Sp = Spring

Table A26. Taxa assemblages in the cluster analysis of the 0.333 mm mesh bongo net collections

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ASSEMBLAGE A

1. *Syngnathus louisianae*
2. *Chasmodes bosquianus*
3. Ophiuroida
4. *Auxis* sp.
5. Coelenterate polyp
6. Polychaete C
7. Scombridae (Unidentified)
8. *?Gobionellus*
9. *?Penaeus*
10. Blennidae (Unidentified)
11. Cephalopoda

ASSEMBLAGE B

1. *Scomberomorus cavalla*
2. Porcellanid zoea
3. *Chaetodipterus faber*
4. Brachyuran megalops D
5. *Citharichthys* sp.
6. *Saphirina* sp.
7. Cladocerans
8. Polychaete A
9. Polychaete D
10. *Latreutes* sp. zoea
11. *Squilla* sp.
12. *Latreutes* sp. postlarvae
13. Unidentified
14. *Etropus* sp.
15. *Peprilus* sp.
16. *Leander* sp. zoea
17. Brachyuran megalops E

ASSEMBLAGE C

1. *Menticirrhus ?littoralis*
2. *Eucinostomus* sp.
3. Unidentified crustacean
4. Porcellanid megalops
5. Pomadasyidae
6. *Upogebia* sp. postlarvae
7. *Mugil* sp.
8. *?Microgobius*
9. Unidentified reptantian megalops
10. *Sicyonia dorsalis* postlarvae
11. *Cynoscion ?nebulosus*
12. Unidentified brachyuran megalops
13. *Mugil cephalus*
14. Polychaete E
15. Brachyuran megalops C
16. Isopoda
17. *Opisthonema oglinum*
18. *Engraulis eurystole*
19. *Oikopleura* sp.
20. *Anchoa* sp.
21. *Cynoscion/?Bairdiella* sp.
22. Alpheid zoea
23. Atherinidae (Unidentified)

Table A26(cont'd)

ASSEMBLAGE D

1. Bothidae (Unidentified)
2. *Larimus fasciatus*
3. Anomuran megalops
4. *Menticirrhus ?americanus*
5. *Cunoscion ?nothus*
6. *Sardinella* sp.
7. Bracyuran megalops F
8. *Microdesmus* sp.
9. *Anchoa lylepus*
10. *Harengula pensacolae*
11. Unidentified natantia
12. *Bairdiella* sp.
13. Cumaceans
14. Soleidae (Unidentified)
15. ?Clupeidae

ASSEMBLAGE E

1. *Anchoa hepsetus*
2. Engraulidae (Unidentified)
3. Clupeidae (Unidentified)
4. Sciaenidae (Unidentified)
5. Unidentified fish
6. Sergestid postlarvae
7. *Acartia tonsa*
8. *Brevoortia*
9. *Anchoa mitchilli*
10. *Cynoscion ?arenarius*
11. Sparidae (Unidentified)
12. Palaemonidae
13. *Pogonias cromis*
14. Unidentified polychaetes
15. *Micropogon undulatus*
16. Pagurid megalops
17. *Citharichthys/?Etropus* sp.
18. Mysidae (Unidentified)
19. *Leiostomus xanthurus*
20. *Myrophus punctatus*
21. Ostracoda
22. Gobiidae (Unidentified)
23. *Callinectes similis*

ASSEMBLAGE F

1. *Scorpaena* sp.
2. *Paralichthys* sp.
3. Stromateidae (Unidentified)
4. *Synodus foetens*
5. Polychaete B
6. *Bothus ocellatus*
7. *Lutjanus* sp.
8. *Sphyraena borealis*
9. *Atlanta* sp.
10. Xanthid megalops
11. *Xiphopenaeus* sp. postlarvae
12. *Albunea* sp. zoea
13. *Scomberomorus maculatus*
14. *Centropages* sp.

Table A26(cont'd)

ASSEMBLAGE G

1. Carangidae (Unidentified)
2. *Chloroscombrus chrysurus*
3. Callianassid sp. zoea I
4. *Krohnitta* sp.
5. *Leptochela* sp.
6. *Trachypenaeus* sp.
7. *Xiphopenaeus* sp. zoea
8. *Symphurus* sp.
9. Brachyuran megalops B
10. Thallacea
11. *Trachypenaeus* sp. postlarvae
12. *Creseis* sp.
13. *Processa* sp. postlarvae
14. *Ogyrides* sp. postlarvae
15. *Upogebia* sp. zoea
16. Portunid megalops
17. Bivalve meroplankton
18. Amphipoda
19. *Menticirrhus* sp.
20. *Lucifer faxoni*
21. *Cynoscion* sp.
22. Unidentified copepods
23. *Sagitta* sp.
24. Reptantian zoea
25. *Labidocera* sp.
26. *Mysidopsis bigelowi*
27. *Temora* sp.
28. Brachyuran megalops A
29. *Eucalanus* sp.
30. *Ogyrides* sp. zoea
31. Stenopodid zoea
32. Gastropod meroplankton
33. Coelenterates
34. *Acetes americanus*

ASSEMBLAGE H

1. *Amphioxas* sp.
2. *Cavolina longirostris*

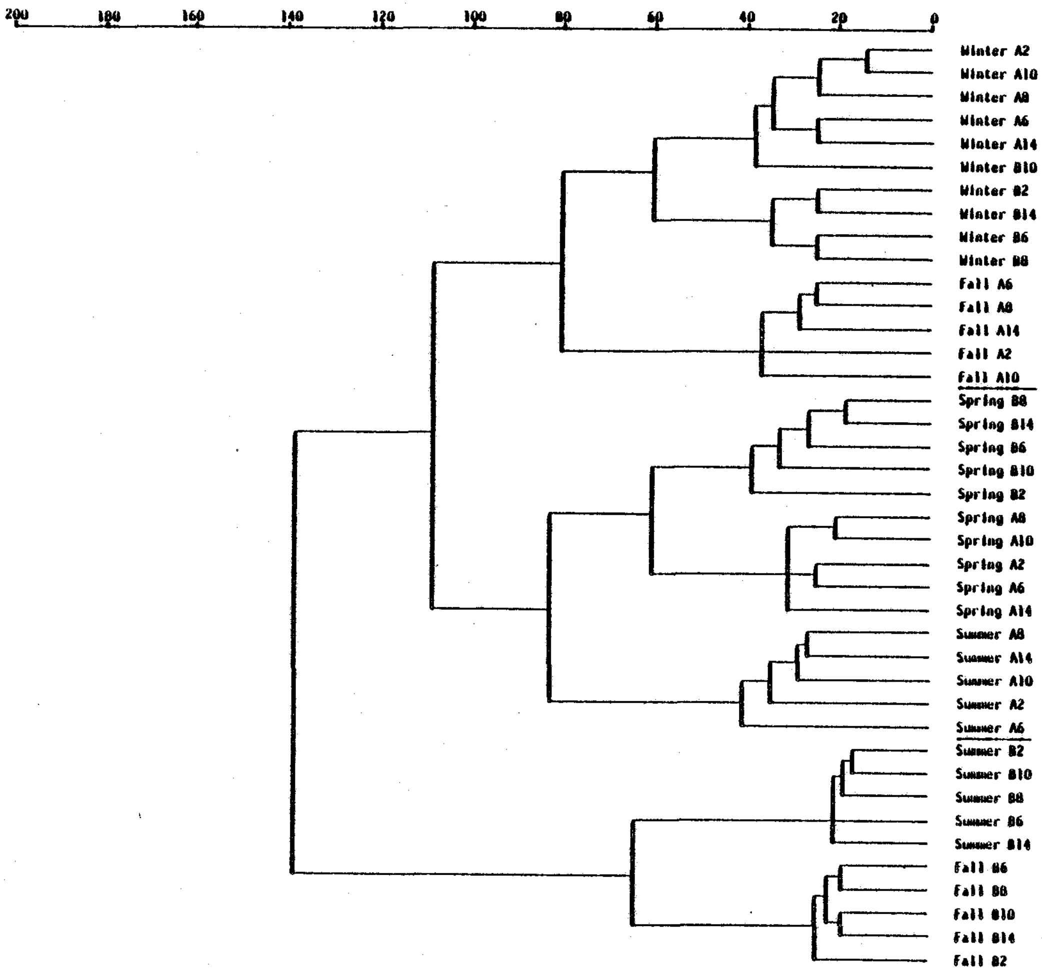

Fig. A9. Bray-Curtis dissimilarity analysis of sites and seasons by taxon presence and abundance for the 0.505 mm mesh bongo net collections.

Table A27. Summary of the two-way table of taxa assemblage associations by site and season for the 0.505 mm mesh bongo net collections.

Taxa Assemblage	WH#2,6,8,10, 14 & WI#10:W	WI#2,6,8, 14:W	WH-All F	WI-All Sp	WH-All Sp	WH-All S	WI-All S	WI-All F
	STATIONS AND SEASONS							
AA	--	--	--	--	--	-	-	--
BB	-	-	-	-	-	-	-	-
CC	--	--	-	-	--	++	+	+
DD	--	--	--	+	-	--	--	--
EE	--	--	--	--	-	--	-	--
FF	--	--	-	-	-	+	++	+
GG	--	-	-	-	--	-	-	+
HH	+	++	++	+	+	++	++	++

++ = very strong association

\+ = strong association

\- = some association

-- = little or no association

WI = Weeks Island

WH = West Hackberry

S = Summer

F = Fall

W = Winter

Sp = Spring

Table A28. Taxa assemblages in the cluster analysis of the 0.505 mm mesh bongo net collections.

ASSEMBLAGE AA

1. *Caranx* sp.
2. *Halieutichthys aculeatus*
3. *Albunea* sp. zoea
4. *Atlanta* sp.
5. *Seriola* sp.
6. Polychaete E
7. *Sardinella anchovia*
8. Polychaete C
9. Atherinidae (Unidentified)

ASSEMBLAGE BB

1. *Citharichthys/Etropus* sp.
2. *Leiostomus xanthurus*
3. Mysidae (Unidentified)
4. Ostracoda
5. *Myrophus punctatus*
6. *Etrumeus teres*
7. *Brevoortia* sp.
8. Polychaete (Unidentified)
9. *Pogonias cromis*
10. Isopoda
11. Bivalve meroplankton
12. *Amphioxus* sp.
13. *Synodus foetens*
14. Brachyuran megalops F
15. Porcellanid megalops
16. Xanthid megalops

ASSEMBLAGE CC

1. Brachyuran megalops C
2. *Opistonema* sp.
3. Scombridae
4. *Anchoa* sp.
5. *Oikopleura* sp.
6. *Opistonema oglinum*
7. *Cynoscion/Bairdiella* sp.
8. Alpheid zoea
9. *Engraulis eurystole*
10. *Chasmodes bosquianus*

ASSEMBLAGE DD

1. ?*Gobionellus* sp.
2. *Mugil* sp.
3. Pomadasyidae
4. Sparidae
5. ?*Microgobius*
6. *Upogebia* sp. postlarvae

Table A28(cont'd)

ASSEMBLAGE EE

1. *Paralichthys* sp.
2. *Leander* sp. zoea
3. *Neomysis* sp.
4. Porcellanid zoea
5. *Scomberomorus cavalla*
6. Brachyuran megalops E

ASSEMBLAGE FF

1. *Centropages* sp.
2. *Peprilus* sp.
3. Blenniidae sp.
4. *Scomberomorus maculatus*
5. *Citharichthys* sp.
6. *Tomoptera* sp.
7. Cepalopoda
8. *Sapphirina* sp.
9. *Trachypenaeus* sp. zoea
10. *Xiphopenaeus* sp. zoea
11. *Symphurus* sp.
12. Brachyuran megalops B
13. Carangidae
14. Callianassid zoea I
15. *Krohnitta* sp.
16. *Chloroscombrus chrysurus*
17. *Latreutes* sp. zoea
18. Callianassid zoea II
19. Brachyuran megalops D
20. Thallacea
21. Polychaete D
22. *Chaetodipterus faber*
23. Polychaete A
24. Cladocerans
25. *Squilla* sp.
26. *Etropus* sp.
27. *Latreutes* sp. postlarvae

ASSEMBLAGE GG

1. *Auxis* sp.
2. *Menticirrhus/Sciaenops* sp.
3. Soleidae
4. ?Clupeidae
5. *Selene vomer*
6. *Harengula pensacolae*
7. *Bairdiella* sp.
8. Cumaceans
9. *Processa* sp. postlarvae
10. *Menticirrhus* sp.
11. *Cynoscion* sp.
12. *Callinectes similis*
13. *Cynoscion ?nothus*
14. *Cynoscion ?nebulosus*
15. *Micropogon undulatus*
16. *Sardinella* sp.

Table A28 (cont'd)

ASSEMBLAGE HH	
1. *Anchoa hepsetus*	16. Brachyuran megalops A
2. Engraulidae (Unidentified)	17. *Eucalanus* sp.
3. *Lucifer faxoni*	18. *Ogyrides* sp. zoea
4. Clupeidae (Unidentified)	19. Gastropod meroplankton
5. *Acartia tonsa*	20. Stenopodid zoea
6. Sergestid postlarvae	21. Coelenterates
7. *Labidocera aestiva*	22. Amphipods
8. *Sagitta* sp.	23. *Ogyrides* sp. postlarvae
9. *Mysidopsis bigelowi*	24. *Upogebia* sp. zoea
10. *Temora* sp.	25. *Leptochela* sp.
11. *Anchoa mitchilli*	26. *Trachypenaeus* sp. postlarvae
12. *Cynoscion ?arenarius*	27. *Actes americanus*
13. Sciaenidae (Unidentified)	28. *Creseis* sp.
14. Palaemonidae	29. Portunid megalops
15. Gobiidae (Unidentified)	30. Pagurid megalops

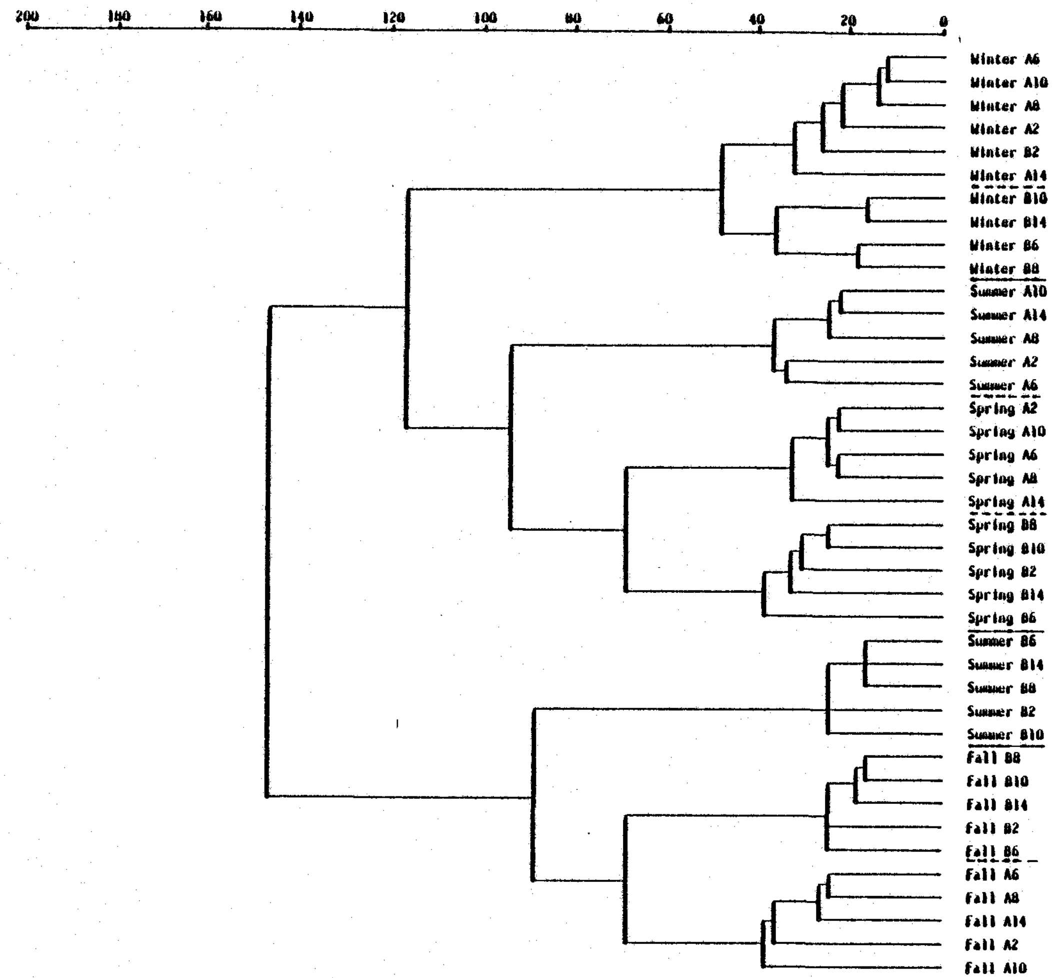

Fig. A10. Bray-Curtis dissimilarity analysis of sites and seasons by taxon presence and abundance for the neuston net collections.

Table A29. Summary of the two-way table of taxa assemblage associations by site and season for the neuston net collections.

Taxa Assemblage	WH#2,6,8,10, 14 & WI#2:W	WI#6,8,10, 14:W	WH-All S	WH-All Sp	WI-All Sp	WI-All S	WI-All F	WH-All F
	STATIONS AND SEASONS							
AAA	--	--	--	--	--	--	--	--
BBB	-	-	--	--	--	--	--	--
CCC	--	--	--	--	--	+	-	-
DDD	--	--	--	--	-	-	++	+
EEE	++	++	++	++	++	++	++	++
FFF	-	-	-	-	--	++	+	+
GGG	-	-	+	-	-	++	++	+

++ = very strong association

+ = strong association

- = weak association

-- = little or no association

WH = West Hackberry

WI = Weeks Island

Sp = Spring

S = Summer
F = Fall
W = Winter

Table A3Q. Taxa assemblages in the cluster analysis of the neuston net collections.

ASSEMBLAGE AAA

1. Scombridae (Unidentified)
2. Xanthid megalops
3. *Engraulis eurystole*
4. *Membras martinica*
5. Gobiidae (Unidentified)
6. Brachyuran megalopes E
7. Bivalve meroplankton
8. Blenniidae (Unidentified)
9. *Chasmodes bosquianus*
10. Atherinidae (Unidentified)
11. Ophichthidae (Unidentified)
12. *Syngnathus louisianae*
13. *Seriola rivoliana*
14. *Selene vomer*
15. *Seriola* sp.
16. *Menticirrhus/?americanus*
17. *Hysobelennius hentzi*
18. *Scomberomorus cavalla*
19. *Scorpaena* sp.
20. *Peprilus alepidotus*
21. Soleidae (Unidentified)
22. *Mugil* sp.
23. *Pogonias chromis*
24. Triglidae (Unidentified)
25. *Microdesmus* sp.
26. *Trichiurus lepturus*
27. *Lobotes surinamensis*
28. *Myrophus punctatus*
29. *Lagodon rhomboides*
30. *Mysidopsis?bahia*
31. Anomuran megalops
32. Porcellanid megalops
33. *Donax* sp.
34. *Leptochela* sp. postlarvae
35. *Leander* sp.
36. *Sicyonia dorsalis* postlarvae

ASSEMBLAGE BBB

1. Mysidae (Unidentified)
2. Ostracoda
3. *Leiostomus xanthurus*
4. *Brevoortia* sp.
5. Bothidae (Unidentified)
6. Isopoda

ASSEMBLAGE CCC

1. *Harengula pensacolae*
2. Brachyuran megalops F
3. *Albunea* sp. zoea
4. Coelenterate polyp
5. *Xiphopenaeus* sp. postlarvae
6. *Tomoptera* sp.
7. *Neomysis* sp.
8. *Atlanta* sp.
9. *Amphioxus* sp.

Table A30(cont'd)

ASSEMBLAGE DDD

1. Cumaceans
2. *Creseis* sp.
3. *Processa* sp. postlarvae
4. *Bairdiella* sp.
5. *Menticirrhus?littoralis*
6. *Sardinella* sp.
7. *Cynoscion?arenarius*
8. *Cynoscion?nothus*
9. *Cynoscion?nebulosus*
10. *Citharichthys/Etropus* sp.
11. ?Clupeidae

ASSEMBLAGE EEE

1. Pomadasyidae (Unidentified
2. Sparidae (Unidentified)
3. Polychaetes (Unidentified)
4. *Anchoa mitchill*
5. Palaemonidae
6. *Lucifer faxoni*
7. Sciaenidae (Unidentified)
8. *Labidocera aestiva*
9. Reptantian zoea
10. *Sagitta* sp.
11. *Temora* sp.
12. *Mysidopsis bigelowi*
13. Clupeidae (Unidentified)
14. *Acartia tonsa*
15. Sergestid postlarvae
16. *Sapphirina* sp.

ASSEMBLAGE FFF

1. *Symphurus* sp.
2. Brachyuran megalops D
3. *Chaetodipterus faber*
4. Polychaete A
5. Polychaete D
6. Thallacea
7. Brachyuran megalops B
8. Callianassid zoea II
9. *Squilla* sp.
10. *Latreutes* sp. zoea
11. Colenterates
12. Cladocerans
13. *Scomberomorus maculatus*
14. *Etropus* sp.
15. *Cynoscion* sp.
16. *Latreutes* sp. postlarvae
17. *Leander* sp. zoea
18. *Peprilus* sp.
19. *Citharichthys* sp.
20. *Sphoeroides* sp.
21. Cephalopoda

ASSEMBLAGE GGG

1. *Trachypenaeus* sp. zoea
2. *Xiphopenaeus* sp. zoea
3. *Trachypenaeus* sp. postlarvae
4. Callianassid zoea I
5. *Ogyrides* sp. zoea
6. Brachyuran megalops A
7. Gastropod meroplankton
8. *Eucalanus* sp.
9. *Leptochela* sp.
10. *Krohnitta* sp.
11. Amphipoda
12. *Acetes americanus*
13. Stenopodid zoea
14. *Micropogon undulatus*
15. Portunid megalops
16. *Ogyrides* sp. postlarvae
17. *Upogebia* sp. zoea
18. Pagurid megalops

Table A30 (cont'd)

ASSEMBLAGE GGG (cont'd)

19.	Carangidae (Unidentified)	25.	*Anchoa* sp.
20.	*Chloroscombrus chrysurus*	26.	*Menticirrhus* sp.
21.	*Opistonema oglinum*	27.	*Oikopleura* sp.
22.	*Cynoscion/Bairdiella* sp.	28.	*Callinectes similis*
23.	*Anchoa hepsetus*	29.	Alpheid zoea
24.	Engraulidae (Unidentified)		

Table A31. Summary of invertebrate collections from the 0.333 mm mesh bongo net.

	West Hackberry				Weeks Island			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
Mean Displacement Volume (ml/100^3)	4,867	2,620	1,096	4,702	5,823	6,131	3,235	5,767
Mean Density (ind/100m^3)	6,882	1,062	325	1,171	3,520	2,950	1,993	1,026
Diversity	0.187	0.858	1.599	1.004	0.620	1.627	0.900	1.548
Richness	0.29	1.35	1.98	0.85	0.98	2.87	2.24	1.48
Evenness	0.15	0.31	0.53	0.42	0.25	0.45	0.27	0.54
Major Taxa (>10% of total mean density)	*Acartia tonsa*	*A. tonsa* *Labidocera* sp.	*Temora* sp. Copepods *Eucalanus* sp.	*A. tonsa* *Temora* sp.	*A. tonsa*	Cladocerans	*Temora* sp.	*A. tonsa* *Labidocera* sp. *Sagitta* sp.

Table A32. Summary of fish collections from the 0.333 mm mesh bongo net.

	West Hackberry				Weeks Island			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
Mean Density (ind/100m^3)	1,104	1,242	360	13	1,006	471	308	90
Diversity	0.89	1.65	0.62	0.49	1.30	1.78	1.94	1.16
Richness	1.06	1.41	0.50	0.35	1.20	1.80	2.06	0.89
Evenness	0.41	0.71	0.42	0.53	0.60	0.72	0.78	0.78
Major Familes (>10% of total density)	Engraulidae Clupeidae Sciaenidae	Clupeidae Engraulidae Sciaenidae	Sciaenidae Carangidae Clupeidae Engraulidae	Clupeidae Sciaenidae	Engraulidae Sciaenidae	Carangidae Engraulidae Sciaenidae	Sciaenidae Carangidae Clupeidae Engraulidae	Clupeidae Sciaenidae

APPENDIX B

Taxa and densities of fish and invertebrates.

Table B1. Taxa and densities (No./100m^3) of fish and invertebrates collected during the spring in the 0.333 mm mesh bongo net.

Species	Station									
	A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Clupeidae	19	120	60	4	2	6	3	2	2	28
Brevoortia sp.	51	42	8	2	4	1	-	-	-	2
Sardinella sp.	2	-	-	-	-	-	-	-	-	-
Engraulidae	54	174	33	24	5	36	28	39	47	471
Anchoa sp.	-	-	-	-	-	-	-	11	-	33
Anchoa hepsetus	32	26	12	15	-	1	8	-	6	52
Anchoa mitchilli	35	91	126	41	13	73	39	173	203	390
Atherinidae	2	-	-	-	-	-	-	-	-	-
Pomadasyidae	-	-	-	-	2	-	1	2	-	-
Sparidae	-	4	46	7	-	4	41	-	16	9
Sciaenidae	-	14	18	13	4	17	28	9	19	66
Cynoscion sp.	-	-	-	2	-	20	-	-	25	19
Cynoscion ?arenarius	16	63	23	4	18	1	9	2	-	50
Menticirrhus sp.	-	-	-	-	-	1	3	2	4	3
Pogonias cromis	4	10	-	-	-	1	-	-	4	-
Mugilidae										
Mugil sp.	-	-	-	-	-	<1	-	2	-	-
Blennidae	-	-	-	-	-	-	-	-	2	-
Gobiidae	-	-	-	-	-	7	-	-	2	-
?Microgobius sp.	-	-	-	-	-	-	-	9	7	3
Unidentified fish	533	885	1,366	931	541	850	114	253	422	1,329
Coelenterata										
Unidentified coelenterate polyp	-	-	-	-	-	-	-	-	-	3
Annelida										
Unidentified polychaetes	-	6	8	-	1,111	-	-	-	4	-
Polychaete A	-	-	-	-	-	-	-	-	4	-
Cephalopoda	-	-	-	-	-	-	-	-	2	2
Gastropod meroplankton	-	-	-	-	-	-	260	-	264	-
Arthropoda	-	-	-	-	-	-	-	-	-	-
Amphipoda	-	-	-	-	-	-	-	-	219	-
Cladocerans	-	-	-	1,282	-	198	122	-	781	1,190

Table B1.(cont'd)

Species	Station A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Arthropoda (cont'd)										
Acartia tonsa	667,614	120,466	819,395	896,715	803,571	137,507	282,435	250,755	90,419	996,976
Labidocera	1,111	1,501	-	1,683	2,222	397	922	1,827	219	12,362
Sapphirina sp.	-	-	-	2	-	-	-	-	-	-
Temora sp.	-	-	-	-	1,042	9,109	260	10,136	1,946	4,010
Unidentified copepods	21,111	3,584	39,583	21,474	11,071	13,735	1,103	6,310	11,787	13,254
Brachyuran megalops A	-	-	-	-	6	7	7	10	12	11
Callinectes similis	-	-	-	-	-	-	-	3	10	-
Eucalanus sp.	-	-	-	-	-	82	-	-	658	-
Lucifer faxoni	-	-	-	-	8	446	1,060	1,105	479	1,193
Ogyrides sp. postlarvae	-	-	-	-	-	-	-	-	-	2
Ogyrides sp. zoea	-	-	-	-	-	-	-	-	7	24
Pagurid megalops	-	-	-	-	-	-	-	-	2	-
Unidentified reptantian megalops	-	-	-	-	-	-	-	2	2	5
Palaemonidae	-	2	2	-	-	6	18	-	-	2
Porcellanid zoea	-	-	-	1,042	-	-	-	-	-	-
Reptantian zoea	-	-	-	-	-	1,881	3,578	3,557	3,591	980
Sergestid postlarvae	8	23	10	7	28	3	1	2	3	4
Stenopodid zoea	-	-	-	-	-	-	3	5	-	2
Sicyonia dorsalis postlarvae	-	-	-	-	-	-	-	-	-	2
Upogebia sp. postlarvae	-	-	-	-	4	85	184	67	-	19
Upogebia sp. zoea	-	-	-	-	-	5	-	-	-	4
Xanthid megalops	-	-	-	-	-	-	-	-	3	5
Mysidopsis bigelowi	-	15	-	-	2	2	10	21	16	85
Hemichordata										
Thallacea	-	-	-	-	-	-	-	-	260	-
Chaetognatha										
Sagitta sp.	-	-	-	2,083	-	2,005	2,831	7,992	27,631	8,467
Unidentified invertebrates	980	-	1,961	11,138	8,998	3,618	3,523	1,778	521	980
TOTALS	691,572	127,026	862,651	936,469	828,652	170,104	296,591	284,074	139,599	1,042,037

Table B1 .(cont'd)

Species	Station									
	A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Clupeidae	1,211	5	252	341	177	2	6	5	12	32
Opistonema oglinum	15	-	4	42	52	-	1	-	-	9
Engraulidae	691	88	414	139	97	95	68	54	333	140
Anchoa sp.	18	39	94	45	21	8	6	8	9	-
Anchoa hepsetus	14	53	103	67	39	35	4	2	5	-
Anchoa mitchilli	-	-	3	-	2	-	-	-	-	-
Engraulis eurystole	-	76	1	9	1	-	-	-	-	-
Synodontidae										
Synodus foetens	-	-	-	-	-	-	-	-	2	-
Atherinidae	9	0	2	1	-	-	-	-	-	-
Sygnathidae										
Sygnathus louisianae	-	-	-	-	-	-	-	-	-	2
Carangidae	10	2	13	12	28	58	92	188	61	209
Chloroscombrus chrysurus	-	-	5	54	9	16	7	23	39	112
Lutjanidae										
Lutjanus sp.	-	-	-	-	-	1	-	-	-	-
Sciaenidae	173	-	58	8	5	-	-	2	-	-
*Cynoscion/Bairdiella**	-	-	34	89	77	64	-	12	13	22
Bairdiella sp.	-	-	-	-	-	-	-	1	-	-
Cynoscion sp.	45	-	-	-	-	-	130	5	31	15
Menticirrhus sp.	7	-	-	2	1	1	8	-	7	5
Ephippidae										
Chaetodipterus faber	-	-	-	-	-	21	4	15	15	12
Sphyraenidae										
Sphyraena borealis	-	-	-	-	-	1	-	-	-	-
Blennidae	7	3	-	-	3	-	-	3	-	2
Chasmodes bosquianus	-	-	-	-	-	-	-	-	-	2
Gobiidae	-	-	-	-	1	1	-	3	2	2
Scombridae	-	-	-	-	1	-	-	-	-	-
Auxis sp.	-	-	-	-	-	-	-	2	-	-
Euthynnus alletteratus	-	-	-	-	-	1	-	-	-	3
Scomberomorus cavalla	-	-	-	-	-	-	1	-	-	-

*Could be either genus.

Table B2. Taxa and densities (No./100m^3) of fish and invertebrates collected during the summer in the 0.333 mm mesh bongon net.

Species	A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
	Station									
Scombridae (cont'd)										
Scomberomorus maculatus	-	-	-	-	-	-	3	-	-	4
Stromateidae	-	-	-	-	-	-	-	-	1	-
Peprilus sp.	-	-	-	-	-	-	3	11	-	3
Scorpaenidae										
Scorpaena sp.	-	-	-	-	-	-	-	-	1	-
Bothidae										
Bothus ocellatus	-	-	-	-	-	1	-	-	-	-
Citharichthys sp.	-	-	-	-	-	10	-	15	22	2
Etropus sp.	-	-	-	-	-	-	5	8	18	-
Paralichthys sp.	-	-	-	-	-	-	-	-	2	-
Cynoglossidae										
Symphurus sp.	-	-	-	-	-	14	24	36	20	26
Unidentified fish	252	8	1,111	14	27	3	11	11	4	16
Coelenterata	926	111	3,406	696	261	13,153	8,877	15,472	12,214	10,230
Unidentified coelenterate polyp	-	-	-	-	-	-	137	-	-	-
Annelida										
Polychaete A	-	-	55	21	-	916	960	849	1,735	2,327
Polychaete B	-	-	-	-	-	95	-	125	-	-
Polychaete C	99	-	-	-	-	-	-	605	-	-
Polychaete D	688	142	1,846	19	561	1,807	10,435	4,579	46,462	13,269
Polychaete E	-	10	-	-	-	-	-	-	-	-
Mollusca										
Atlanta sp.	-	-	-	-	-	142	-	-	-	-
Bivalve meroplankton	109	-	53	21	-	392	-	28	109	122
Cephalopoda	-	-	-	-	56	-	-	-	-	2
Creseis sp.	-	-	-	-	-	42	-	99	109	31
Gastropod meroplankton	-	35	325	454	432	3,924	3,569	743	2,947	756
Amphipoda	927	35	443	332	-	5,753	389	283	983	214
Cladocerans	3,518	90	3,719	2,293	40	347,370	357,291	162,445	15,164	38,773
Acartia tonsa	86,457	46,724	110,744	63,944	104,806	2,139	-	2,406	688	885
Centropages sp.	-	-	-	-	-	250	-	-	-	-
Labidocera	16,499	3,322	7,700	21,804	12,143	42	4,157	7,605	4,109	688
Sapphirina sp.	-	1	-	-	-	491	208	474	43	95

Table B2.(cont'd)

Species	Station A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Arthropoda (cont'd)										
Temora sp.	165	-	-	-	184	29,880	17,472	8,350	46,472	5,938
Unidentified copepods	1,065	1,514	1,521	2,507	1,234	9,875	13,405	12,722	14,769	12,343
Cumaceans	-	-	-	-	-	-	-	1	-	19
Acetes americanus	-	-	-	-	4	486	15	17	6	14
Albunea sp. zoea	-	-	-	-	-	489	-	7	-	11
Alpheid zoea	2	-	2	1	1	96	1	-	-	-
Anomuran megalops	-	-	-	-	-	-	-	-	-	2
Brachyuran megalops A	17	3	35	18	7	3,718	217	73	148	269
Brachyuran megalops B	-	-	-	-	1	3,343	155	82	112	141
Brachyuran megalops C	-	-	10	-	-	-	-	-	-	-
Brachyuran megalops D	-	-	-	-	-	484	30	3	43	20
Brachyuran megalops E	-	-	-	-	-	-	3	-	6	2
Callianassid sp. zoea I	-	2	3	2	1	1,168	87	88	19	267
Callianassid sp. zoea II	-	-	-	-	-	-	77	17	6	32
Eucalanus sp.	83	219	278	-	488	6,508	7,971	12,646	3,750	6,253
Latreutes sp. postlarvae	-	-	-	-	-	-	-	8	1	-
Latreutes sp. zoea	-	-	-	-	-	199	30	27	46	13
Leander sp.	-	-	-	-	-	-	1	-	-	2
Leptochela sp.	-	-	-	-	-	103	19	3	9	15
Lucifer faxoni	264	-	9	1,222	-	198	92	-	43	6
Ogyrides sp. postlarvae	1	-	-	5	-	110	77	22	5	5
Ogyrides sp. zoea	9	4	10	31	8	17,653	2,911	551	819	803
Pagurid megalops	-	-	-	-	-	1	6	3	12	-
Unidentified reptantian megalops	3	-	-	-	-	-	1	-	-	-
Portunid megalops	-	-	-	-	-	286	7	6	-	7
Palaemonidae	-	-	4	-	3	1	-	3	-	-
?Penaeus sp. zoea	-	-	-	-	1	-	-	-	-	-
Porcellanid megalops	-	-	-	-	-	-	272	-	-	-
Processa sp. postlarvae	-	-	-	-	-	579	8	-	-	4

Table B2.(cont'd)

Species	Station A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Arthropoda (cont'd)										
Reptantian zoea	2,392	149	621	3,396	855	2,765	8,813	7,866	6,019	4,577
Sergestid postlarvae	-	1	-	1	2	667	4	3	5	2
Squilla sp.	-	-	-	-	-	1,562	14	42	11	32
Stenopodid zoea	5	-	2	14	-	9,203	693	212	565	222
Trachypenaeus sp. postlarvae	-	-	-	-	-	7	47	11	1	7
Trachypenaeus sp. zoea	-	-	-	-	-	1,027	73	79	120	97
Upogebia sp. zoea	-	-	-	17	-	200	40	8	5	11
Xanthid megalops	-	-	-	1	-	196	-	-	-	-
Xiphopenaeus sp. postlarvae	-	-	-	-	-	95	-	2	-	3
Xiphopenaeus sp. zoea	-	-	-	-	-	9,082	680	317	782	170
Isopoda	-	-	358	1	-	-	-	-	-	-
Mysidopsis bigelowi	42	8	28	12	15	1	138	47	40	9
Neomysis americana	-	-	3	8	-	-	-	24	-	-
Unidentified mysid	-	-	-	-	-	-	1	-	-	-
Echinodermata										
Ophiuroidea	-	-	-	-	-	-	-	-	-	73
Hemichordata										
Oikopleura sp.	411	2,233	3,441	441	7,752	42	-	-	508	-
Thallacea	182	-	128	-	74	8,214	1,195	6,393	5,263	6,520
Chaetognatha										
Sagitta sp.	483	35	269	685	306	7,113	8,125	3,376	1,845	8,277
Krohnitta sp.	-	-	-	-	-	632	208	998	129	824
Unidentified invertebrates	-	-	1	-	-	-	807	2,167	43	-
TOTALS	116,800	54,912	137,108	98,769	129,776	492,831	449,960	252,306	166,887	115,449

Table B3. Taxa and densities (No./100m^3) of fish and invertebrates collected during the fall in the 0.333 mm mesh bongo net.

Species	Station									
	A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Clupeidae	-	-	-	-	-	5	5	7	0	25
Harengula pensacolae	-	2	-	-	-	-	-	3	-	-
Opistonema oglinum	3	-	3	-	-	4	49	5	10	14
Sardinella sp.	-	2	-	-	-	19	-	-	-	6
?Clupeidae	-	-	-	6	1	-	-	58	25	-
Engraulidae	-	-	-	-	-	1	10	6	-	10
Anchoa sp.	-	-	-	-	-	-	1	-	3	1
Anchoa hepsetus	-	-	-	-	-	1	9	3	7	12
Anchoa lyoleyis	-	-	-	-	-	-	-	7	-	-
Anchoa mitchilli	6	-	-	-	2	-	-	2	-	-
Exocoetidae	-	-	-	-	-	-	8	6	13	12
Atherinidae	-	-	-	4	6	39	47	38	22	35
Membras martinica	-	2	-	1	2	2	6	5	1	6
Gerreidae										
Eucinostomus sp.	1	-	-	-	-	-	-	-	-	-
Sciaenidae	-	-	-	-	3	1	2	14	20	14
*Cynoscion/Bairdiella**	-	-	-	-	-	-	-	-	2	17
Bairdiella sp.	-	-	-	-	1	20	-	2	12	3
Cynoscion sp.	-	-	-	-	6	24	40	8	4	-
Cynoscion ?arenarius	-	2	-	-	-	-	-	-	-	9
Cynoscion ?nebulosus	-	-	-	-	-	3	-	-	-	1
Cynoscion ?nothus	-	6	5	-	-	3	-	-	35	3
Larimus fasciatus	-	-	-	-	-	-	-	-	2	-
Menticirrhus sp.	-	-	-	-	-	13	8	6	-	1
Menticirrhus ?americanus	-	3	-	-	-	-	-	-	1	-
Menticirrhus ?littoralis	1	-	-	-	-	-	-	-	-	-
Micropogon undulatus	1	8	-	-	2	4	-	3	12	13
Blennidae	-	-	-	-	-	-	-	5	-	-
Gobiidae	-	2	-	-	-	-	1	-	-	-
?Microgobius	-	-	-	-	2	-	-	-	-	-
Microdesmidae										
Microdesmus sp.	-	-	-	-	-	-	-	1	-	-
Scombridae										
Scomberomorus maculatus	-	-	-	-	-	-	2	-	-	-

Table B3 .(cont'd)

Species	Station									
	A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Bothidae	-	-	-	-	-	-	-	-	1	-
Etropus sp.	-	-	-	-	-	2	-	-	-	1
Soleidae	-	-	-	-	-	-	1	2	1	-
Cynoglossidae										
Symphurus sp.	-	-	-	-	-	-	1	1	13	7
Unidentified fish	1	-	7	1,662	38	19	68	338	56	137
Coelenterata	6	31	88	17	83	155	33	113	739	0
Annelida										
Polychaete A	-	-	-	-	-	-	-	56	-	-
Polychaete D	14	-	-	-	56	102	-	-	-	-
Mollusca										
Bivalve meroplankton	-	-	-	6	-	59	234	651	-	139
Cavolina longirostris	-	-	-	-	-	1	-	-	-	-
Creseis sp.	36	16	70	403	327	237	341	888	2,564	1,462
Gastropod meroplankton	-	63	133	-	27	104	1,005	2,513	1,438	208
Arthropoda										
Unidentified crustacean	3	-	-	1	-	-	-	-	-	-
Amphipoda	-	-	-	5	1	296	468	335	486	1,352
Cladocerans	-	-	-	-	-	45	-	151	-	-
Acartia tonsa	4,315	-	-	-	-	-	-	-	-	-
Labidocera	735	2,470	698	138	5,865	895	365	56	87	1,313
Sapphirina sp.	-	-	-	6	-	-	-	-	-	-
Temora sp.	681	12,105	28,195	591	23,105	86,434	137,834	72,309	241,453	274,930
Unidentified copepods	771	11,349	9,137	2,545	19,565	10,231	5,611	10,013	16,500	10,544
Cumaceans	6	-	-	5	47	3,043	1,123	483	513	577
Acetes americanus	-	39	-	4	12	111	24	122	245	303
Anomuran megalops	-	-	-	1	-	-	-	-	4	-
Brachyuran megalops A	102	60	36	41	53	173	307	626	230	293
Brachyuran megalops B	-	-	-	-	1	-	2	-	5	3
Brachyuran megalops E	-	-	-	-	-	-	1	-	-	-
Brachyuran megalops F	7	9	-	-	-	-	-	-	-	1

Table B3.(cont'd)

Species	Station A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Arthropoda (cont'd)										
Unidentified brachyuran megalops	-	-	-	-	47	-	-	-	-	-
Callianassid sp. zoea I	-	-	6	-	-	5	59	11	119	22
Callianassid sp. zoea II	-	-	-	-	1	-	9	-	8	38
Callinectes similis	-	-	-	-	-	7	10	-	-	11
Eucalanus sp.	232	1,699	3,720	2,953	7,681	3,709	2,070	3,060	4,494	2,734
Latreutes sp. postlarvae	-	-	-	-	-	-	-	-	-	1
Latreutes sp. zoea	1	-	-	-	1	1	-	-	-	-
Leptochela sp.	-	2	-	-	3	-	15	10	9	4
Lucifer faxoni	3	49	28	5	303	51	2,182	1,083	1,329	588
Unidentified natantia	4	-	6	1	2	16	47	59	32	16
Ogyrides sp. postlarvae	5	-	16	5	33	-	9	-	-	3
Ogyrides sp. zoea	54	21	123	12	275	-	155	385	264	503
Pagurid megalops	17	9	19	3	13	-	-	-	-	1
Unidentified reptantian megalops	13	-	14	8	11	-	-	-	-	-
Portunid megalops	-	-	-	4	4	-	5	-	4	1
Porcellanid megalops	-	-	-	18	-	-	-	-	-	-
Processa sp. postlarvae	-	2	-	2	-	27	6	19	34	6
Reptantian zoea	130	298	621	172	184	451	2,010	4,319	1,897	1,463
Sergestid postlarvae	3	-	-	4	3	87	59	-	3	-
Squilla sp.	-	-	-	-	1	2	1	8	-	-
Stenopodid zoea	-	-	2	-	5	207	550	157	276	762
Trachypenaeus sp. postlarvae	12	9	7	30	6	85	47	16	65	17
Trachypenaeus sp. zoea	6	-	-	39	2	7	2	18	35	17
Upogebia sp. zoea	32	13	123	1	6	-	1	2	-	5
Xiphopenaeus sp. zoea	-	2	9	-	1	7	13	19	32	22
Isopoda	1	-	-	-	-	-	-	-	-	-
Mysidopsis bigelowi	1	7	2	1	5	7	16	57	117	3

Table B3.(cont'd)

Species	Station									
	A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Arthropoda (cont'd)										
Unidentified mysid	-	-	-	-	1	-	-	-	-	-
Hemichordata										
Oikopleura sp.	61	1,180	769	437	1,344	1,647	67	2,692	149	-
Thallacea	12	-	-	12	30	-	67	113	446	248
Chordata										
Amphioxas sp.	-	-	-	-	-	45	-	-	-	-
Chaetognatha										
Sagitta sp.	955	815	3,120	1,181	5,713	5,580	8,120	7,344	23,199	16,397
Krohnitta sp.	-	-	28	21	120	311	321	387	173	-
Unidentified invertebrates	388	2,525	675	-	-	-	-	-	-	-
TOTALS	8,619	32,800	47,660	10,345	65,003	114,204	163,447	108,594	297,189	314,314

*Could be either genus.

Table B4. Taxa and densities (No./100m^3) of fish and invertebrates collected during the winter in the 0.333 mm mesh bongo net.

Species	Station A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Ophicthidae										
Myrophis punctatus	-	-	-	-	-	-	-	2	1	-
Clupeidae	16	2	4	6	-	22	116	30	15	3
Brevoortia sp.	2	1	-	5	-	1	14	19	3	4
Carangidae	-	-	-	-	-	-	-	-	-	3
Sciaenidae	2	2	-	-	-	-	-	2	<1	-
Leiostomus xanthurus	-	-	1	1	1	5	11	9	-	-
Micropogon undulatus	1	2	1	-	9	8	33	38	11	41
Mugilidae										
Mugil cephalus	-	-	-	-	-	1	-	-	-	-
Gobiidae	-	-	-	2	-	-	-	4	2	4
*Citharichthys/Etropus**	-	-	1	-	-	-	12	2	1	3
Unidentified fish	1	-	-	-	-	1	3	5	1	-
Coelenterata	-	151	468	184	-	283	1,433	-	162	860
Annelidae										
Bivalve meroplankton	-	-	160	-	-	-	-	-	-	753
Creseis sp.	-	-	-	-	-	-	-	-	-	108
Gastropod meroplankton	308	194	160	88	-	62	288	798	-	58
Amphipoda	-	-	-	-	-	-	-	-	483	1,194
Cladocerans	-	-	-	-	-	-	-	-	-	215
Acartia tonsa	92,635	37,285	95,287	28,895	89,096	25,680	97,912	38,839	22,347	7,588
Labidocera	3,300	306	4,751	2,786	433	7,207	46,527	58,601	9,496	14,238
Temora sp.	41,512	3,341	63,114	45,293	754	3,886	9,916	5,211	4,792	13,226
Unidentified copepods	914	967	1,172	2,902	1,552	1,898	4,558	399	1,270	5,169
Acetes americanus	4	-	6	7	1	6	10	12	13	45
Brachyuran megalops A	3	-	-	4	-	15	17	44	18	7
Brachyuran megalops B	-	-	-	-	-	-	1	-	-	-
Callinectes similis	-	-	-	-	-	-	-	7	1	-
Eucalanus sp.	185	-	-	164	-	394	3,535	659	732	1,544
Latreutes sp. zoea	-	-	-	-	-	3	1	1	1	-
Leptochela sp.	-	-	-	-	-	-	-	-	<1	-
Lucifer faxoni	-	-	-	-	-	26	-	-	51	-
Ogyrides sp. postlarvae	-	-	-	-	-	5	1	-	-	-
Ogyrides sp. zoea	-	-	-	-	-	-	2	1	-	4
Pagurid megalops	3	2	8	4	3	1	123	52	4	30

Table B4.(cont'd)

Species	Station									
	A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Arthropoda (cont'd)										
Portunid megalops	2	-	-	-	-	7	12	27	-	3
Palaemonidae	-	-	-	-	-	-	-	-	4	-
Processa sp. postlarvae	-	-	-	-	-	-	-	6	-	-
Reptantian zoea	1,366	-	240	-	72	2,318	8,468	3,902	4,019	8,487
Sergestid postlarvae	1	-	7	-	1	6	-	11	6	-
Squilla sp.	-	-	-	-	-	-	-	-	1	-
Stenopodid zoea	3	-	11	9	-	2	9	15	12	42
Trachypenaeus sp. postlarvae	-	-	-	-	-	-	-	1	-	-
Mysidopsis bigelowi	227	59	228	39	121	270	2	23	4	68
Unidentified mysid	-	2	-	4	-	-	4	4	10	24
Ostracoda	122	-	-	-	83	-	-	290	531	338
Chaetognatha										
Sagitta sp.	12,531	5,706	18,450	5,964	7,699	3,718	19,850	17,800	5,275	3,825
Unidentified invertebrates	5,843	2,360	1,418	2,540	1,963	725	3,544	672	36	1,156
TOTALS	158,981	50,380	185,487	88,897	101,788	46,550	196,408	147,486	49,302	59,130

*Could be either genus.

2.2-91

Table B5 . Taxa and densities (No./100m³) of fish and invertebrates collected during the spring in the 0.505 mm mesh bongo net.

Species	Station A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Clupeidae	16	172	41	4	8	-	3	3	-	23
Brevoortia sp.	78	346	3	6	4	4	-	-	-	16
Engraulidae	24	141	21	15	6	13	32	31	40	487
Anchoa sp.	-	-	-	-	2	-	-	2	-	11
Anchoa hepsetus	33	26	5	10	-	-	14	2	11	63
Anchoa mitchilli	68	53	158	66	-	25	49	281	173	184
Atherinidae	-	-	2	-	-	-	-	-	-	-
Pomadasyidae	-	-	2	-	-	-	2	2	-	-
Sparidae	-	-	12	4	-	-	3	2	-	-
Sciaenidae	-	2	14	4	2	-	14	10	6	14
Cynoscion sp.	-	-	-	-	-	3	-	-	-	62
Cynoscion ?arenarius	10	8	18	6	2	-	9	2	7	53
Cynoscion ?nebulosus	-	-	-	-	-	-	-	-	-	2
Menticirrhus sp.	-	-	-	-	-	2	2	7	-	10
Pogonias cromis	2	20	-	-	2	-	3	-	5	-
Mugilidae										
Mugil sp.	-	-	-	-	-	-	2	-	5	-
Gobiidae	-	-	4	-	-	-	4	-	13	5
?Gobinelius	-	-	-	-	-	-	-	-	1	-
?Microgobius	-	-	-	-	-	-	6	10	-	-
Unidentified fish	614	985	1,131	898	614	424	113	405	453	1,204
Coelenterata	-	-	7	-	-	-	-	-	-	-
Annelida										
Unidentified polychaetes	6	3	9	9	-	-	-	2	-	-
Polychaete A	-	-	-	-	2	-	-	-	-	-
Mollusca										
Bivalve meroplankton	-	5	-	-	-	-	-	-	-	-
Gastropod meroplankton	-	-	-	-	-	3	-	-	-	-
Arthropoda										
Amphipoda	8	5	7	4	3	-	-	-	-	-
Cladocerans	-	5	14	170	15	30	37	-	237	-
Acartia tonsa	1,210	637	3,282	3,874	471	523	1,454	6,100	552	2,571
Labidocera	441	794	252	892	553	133	729	1,466	117	5,051

Table B5.(cont'd)

Species	Station A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Arthropoda (cont'd)										
Termora sp.	8	-	-	4	4	79	24	58	29	84
Unidentified copepods	70	73	73	67	65	105	454	284	142	191
Acetes americanus	-	-	-	-	-	-	2	-	4	-
Brachyuran megalops A	-	-	-	-	8	10	1	5	24	18
Callinectes similis	-	-	-	-	-	-	-	2	3	3
Eucalanus sp.	-	-	-	-	-	24	-	-	54	-
Lucifer faxoni	-	4	18	14	3	154	1,480	922	471	974
Unidentified natantia	-	-	-	-	-	2	-	-	-	-
Ogyrides sp. postlarvae	-	-	-	-	-	-	-	-	-	2
Ogyrides sp. zoea	-	-	2	-	-	-	-	12	8	13
Pagurid megalops	-	-	-	-	-	2	3	2	-	8
Unidentified reptantian megalops	-	-	-	-	-	-	-	-	7	-
Palaemonidae	2	3	5	-	-	-	16	10	3	-
Porcellanid zoea	2	-	-	14	2	-	-	-	-	-
Reptantian zoea	6	17	4	13	4	362	489	2,518	1,238	939
Sergestid postlarvae	-	33	18	2	12	-	2	2	10	13
Stenopodid zoea	-	-	-	-	-	-	3	2	-	2
Upogebia sp. postlarvae	-	-	-	4	-	6	56	10	-	6
Xanthid megalops	-	-	-	2	-	-	-	-	1	-
Isopoda	4	-	-	-	2	-	-	-	-	-
Mysidopsis bigelowi	4	6	-	-	2	1	7	19	34	70
Hemichordata										
Thallacea	6	-	-	-	-	-	267	-	59	-
Chordata										
Amphioxas sp.	4	-	-	-	-	-	-	-	-	-
Chaetognatha										
Sagitta sp.	60	9	69	78	30	812	3,590	5,079	20,188	4,712
Unidentified invertebrates	2	-	7	72	6	8	26	-	18	-
TOTALS	2,678	3,347	5,178	6,232	1,822	2,725	8,896	17,250	23,913	16,791

Table B6. Taxa and densities (No./100m³) of fish and invertebrates collected during summer in the 0.505 mm mesh bongo net.

Species	Station									
	A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Clupeidae	440	1	31	92	84	-	2	6	7	36
Opistonema sp.	-	-	-	1	-	-	-	-	-	-
Opistonema oglinum	11	-	5	31	54	-	-	-	2	17
Sardinella sp.	-	1	-	-	-	-	-	-	-	-
Sardinella anchovia	2	-	-	-	-	-	-	-	-	-
Engraulidae	208	59	414	78	57	42	44	48	147	78
Anchoa sp.	18	25	39	23	24	3	7	8	8	8
Anchoa hepsetus	6	45	70	63	42	40	4	9	3	2
Anchoa mitchilli	-	-	4	-	2	-	-	-	-	-
Engraulis eurystole	-	-	6	7	-	-	-	-	-	-
Ogcocephalidae	-	-	-	-	-	1	-	-	-	-
Atherinidae										
Membras martinica	2	-	1	-	-	-	-	-	-	-
Carangidae	5	1	5	-	34	33	103	196	55	310
Caranx sp.	-	-	-	-	-	1	-	-	-	-
Chloroscombrus chrysurus	-	-	3	74	-	24	22	61	20	48
Seriola sp.	-	1	-	-	-	-	-	-	-	-
Sciaenidae	-	-	1	1	21	-	-	-	-	1
*Cynoscion/Bairdiella**	-	-	20	53	47	74	-	17	22	-
Cynoscion sp.	31	3	-	-	-	-	98	5	37	40
Menticirrhus sp.	3	-	-	-	3	8	2	4	2	3
Ephippidae										
Chaetodipterus faber	-	-	-	1	-	20	3	3	24	5
Blennidae	-	-	-	-	-	-	-	2	-	-
Chasmodes bosquianus	-	1	1	1	-	-	-	-	-	-
Gobiidae	1	3	1	-	2	2	1	5	2	-
Scombridae	-	-	-	6	2	-	-	-	-	-
Scomberomorus cavalla	-	-	-	-	-	-	1	-	-	2
Scomberomorus maculatus	-	-	-	-	-	1	-	2	3	-
Stromateidae										
Peprilus sp.	-	-	-	-	-	-	-	10	-	-

Table B6.(cont'd)

Species	Station A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Bothidae										
Citharichthys sp.	-	-	-	-	-	2	-	9	10	-
Etropus sp.	-	-	-	-	-	-	9	5	30	6
Paralichthys sp.	-	-	-	-	-	-	1	-	-	-
Cynoglossidae										
Symphurus sp.	-	-	-	-	-	24	26	40	19	16
Unidentified fish	138	29	1,860	17	11	6	-	21	34	11
Coelenterata	1,252	61	1,051	135	317	7,436	2,946	10,315	11,759	5,871
Annelida										
Polychaete A	-	19	35	-	67	412	242	694	1,468	1,431
Polychaete B	-	-	-	-	-	128	-	106	78	-
Polychaete C	11	-	-	-	-	17	-	-	-	-
Polychaete D	11	126	242	7	-	657	537	1,066	8,631	2,424
Polychaete E	2	3	-	-	-	-	-	-	-	-
Mollusca										
Atlanta sp.	-	-	-	-	-	44	-	-	-	-
Bivalve meroplankton	-	-	-	-	-	-	-	-	-	49
Cephalopoda	-	-	-	-	-	1	-	2	-	-
Creseis sp.	-	-	-	-	-	17	19	15	38	-
Gastropod meroplankton	11	27	-	50	34	1,638	1,690	574	1,570	266
Arthropoda										
Amphipoda	4,116	-	193	28	1	1,284	114	553	229	263
Cladocerans	1,143	39	124	477	74	10,969	13,163	13,268	1,867	2,080
Acartia tonsa	677	267	2,754	1,975	7,117	-	-	138	-	-
Centropages sp.	-	-	-	-	-	-	-	400	-	-
Labidocera	3,971	542	2,511	6,366	10,959	133	621	444	668	839
Sapphirina sp.	-	-	-	-	-	74	54	213	38	-
Temora sp.	-	-	-	-	-	453	225	680	95	159
Unidentified copepods	1,535	697	445	3,060	813	1,150	1,237	2,047	4,271	900
Cumaceans	-	-	-	-	-	-	-	7	-	25
Acetes americanus	-	-	-	-	1	3	15	19	53	15

Table B6. (cont'd)

Species	Station A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Arthropoda (cont'd)										
Albunea sp. zoea	-	-	-	-	-	33	-	-	12	-
Alpheid zoea	-	-	4	-	4	-	-	-	1	-
Brachyuran megalops A	6	5	24	3	20	158	240	48	35	207
Brachyuran megalops B	-	-	-	-	-	126	72	66	28	90
Brachyuran megalops C	-	-	11	-	-	-	-	-	-	-
Brachyuran megalops D	-	-	-	-	-	3	898	2	9	16
Brachyuran megalops E	-	-	-	-	-	-	-	-	-	7
Callianassid sp. zoea I	-	21	2	-	1	34	55	129	22	163
Callianassid sp. zoea II	-	-	-	-	-	1	42	10	9	28
Eucalanus sp.	45	26	26	-	175	3,147	2,529	4,517	1,825	2,441
Latreutes sp. postlarvae	-	-	-	-	-	-	5	2	126	3
Latreutes sp. zoea	-	-	-	1	-	15	21	26	29	14
Leander sp. zoea	-	-	-	-	-	-	1	-	-	-
Leptochela sp.	-	-	-	-	-	15	14	7	8	7
Lucifer faxoni	438	4	6	586	20	102	38	77	63	-
Ogyrides sp. postlarvae	-	-	-	11	1	6	23	27	4	10
Ogyrides sp. zoea	-	25	7	28	6	485	1,299	451	535	453
Pagurid megalops	-	-	-	-	-	1	1	2	-	-
Unidentified reptantian megalops	-	-	-	-	-	74	-	-	69	-
Portunid megalops	-	1	1	-	-	1	6	4	21	-
Palaemonidae	-	-	4	1	1	6	-	6	-	2
Porcellanid zoea	-	-	-	-	-	-	171	-	-	-
Processa sp. postlarvae	-	-	-	-	-	2	7	-	1	-
Reptantian zoea	3,807	119	1,184	1,510	1,888	2,023	3,478	7,006	3,871	2,741
Sergestid postlarvae	-	-	1	-	12	-	8	4	4	-
Squilla sp.	-	-	-	-	1	87	1	80	6	15
Stenopodid zoea	1	-	2	5	1	406	662	373	436	185
Trachypenaeus sp. postlarvae	-	-	-	-	-	5	34	15	6	16
Trachypenaeus sp. zoea	-	19	-	-	-	78	52	44	146	53
Upogebia sp. postlarvae	-	-	-	-	-	-	1	-	-	-
Upogebia sp. zoea	-	-	1	8	-	6	15	2	3	15
Xanthid megalops	-	-	-	1	-	1	-	-	-	-

Table B6. (cont'd)

Species	Station A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Arthropoda (cont'd)										
Xiphopenaeus sp. zoea	-	-	-	-	-	261	472	237	332	149
Isopoda	1	-	-	-	1	-	-	-	-	-
Musidopsis bigelowi	5	4	18	17	21	2	33	104	5	5
Neomysis americana	-	-	-	-	-	-	1	-	-	-
Hemichordata										
Oikopleura sp.	-	172	820	286	5,272	17	27	119	77	-
Thallacea	52	4	30	151	-	7,134	1,135	2,664	5,087	5,850
Chaetognatha										
Sagitta sp.	56	9	54	169	50	729	844	876	270	1,191
Krohnitta sp.	-	-	-	-	-	253	421	1,629	86	639
Unidentified invertebrates	-	-	1	-	-	-	-	290	-	-
TOTALS	18,005	2,359	12,012	15,323	27,240	39,908	33,792	49,809	44,316	29,211

*Could be either genus

Table B7. Taxa and densities (No./100m³) of fish and invertebrates collected during fall in the 0.505 mm mesh bongo net.

Species	Station									
	A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Clupeidae	-	-	-	-	-	6	8	8	-	1
Harengula pensacolae	-	-	-	-	-	1	-	3	-	-
Opistonema oglinum	-	-	-	-	-	-	-	-	-	-
Sardinella sp.	4	5	-	-	-	41	-	1	3	8
?Clupeidae	-	-	-	6	-	-	-	52	13	-
Engraulidae	-	-	-	-	-	2	12	8	2	10
Anchoa sp.	-	-	-	-	5	-	3	-	3	1
Anchoa hepsetus	-	-	-	-	2	1	9	16	7	17
Anchoa mitchilli	-	-	-	-	-	3	-	-	-	-
Engraulis eurystole	-	-	-	-	-	-	4	1	4	2
Synodontidae	-	-	-	-	-	-	-	-	-	-
Synodus foetens	-	-	-	-	-	-	3	-	-	-
Carangidae	-	-	-	1	6	64	28	15	15	20
Chloroscombrus chrysurus	-	-	-	1	6	10	5	1	-	4
Selene vomer	-	-	-	-	-	-	-	1	-	-
Sciaenidae	-	-	-	-	-	-	1	9	3	5
*Cynoscion/Bairdiella**	-	-	-	-	-	-	-	-	3	13
*Menticirrhus/Sciaenops**	-	-	-	-	-	-	-	-	2	-
Bairdiella sp.	-	-	-	-	-	31	14	-	6	7
Cynoscion sp.	-	-	-	-	-	17	17	9	17	-
Cynoscion ?arenarius	-	-	-	-	-	-	-	-	4	8
Cynoscion ?nebulosus	-	2	2	-	4	-	-	-	7	1
Cynoscion ?nothus	-	10	4	-	-	2	-	-	9	13
Menticirrhus sp.	3	2	-	-	-	16	11	4	-	4
Micropogon undulatus	5	9	-	-	4	6	-	4	15	16
Blennidae	-	-	1	-	-	-	-	1	-	-
Gobiidae	-	-	-	1	-	-	-	-	-	-
Scombridae	-	-	-	-	-	-	-	-	-	-
Auxis sp.	-	-	-	-	-	-	-	-	1	-
Bothidae	-	-	-	-	-	-	-	-	-	-
*Citharichthys/Etropus**	-	-	-	-	-	-	-	-	2	-
Etropus sp.	-	-	-	-	-	2	-	-	1	-
Soleidae	-	-	-	-	-	-	-	1	2	-

Table B7.(cont'd)

Species	Station									
	A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Cynoglossidae	-	-	-	-	-	-	-	-	-	-
Symphurus sp.	1	3	-	-	-	4	5	-	3	4
Unidentified fish	1	2	7	1,774	52	69	122	359	68	156
Coelenterata	5	10	95	7	110	76	38	48	129	42
Annelida	-	-	-	-	-	-	-	-	-	-
Polychaete A	1	-	-	-	-	-	5	-	-	-
Polychaete D	-	-	-	-	53	-	-	11	27	10
Mollusca	-	-	-	-	-	-	-	-	-	-
Atlanta sp.	-	-	-	-	-	-	9	-	-	20
Bivalve meroplankton	-	-	-	-	-	-	20	11	-	-
Creseis sp.	37	3	52	194	528	338	203	390	1,719	780
Gastropod meroplankton	3	10	25	4	72	155	253	280	291	57
Arthropoda	-	-	-	-	-	-	-	-	-	-
Unidentified crustacean	5	-	3	2	-	-	-	-	-	1
Amphipoda	-	-	-	6	-	34	113	173	349	299
Cladocerans	-	-	-	-	-	-	-	-	16	-
Acartia tonsa	130	-	-	-	-	-	-	-	-	-
Labidocera	699	1,905	375	175	3,119	561	552	129	144	392
Sapphirina sp.	-	7	8	1	-	-	-	-	-	-
Temora sp.	6	56	153	2	193	869	1,297	1,092	3,816	3,783
Unidentified copepods	197	1,462	2,032	179	2,799	5,266	1,922	2,964	3,918	2,938
Cumaceans	1	21	32	-	3	3,170	743	608	281	382
Acetes americanus	8	65	2	-	23	145	36	71	266	217
Anomuran megalops	-	-	-	-	-	1	-	-	10	-
Brachyuran megalops A	122	54	35	40	52	276	322	763	143	166
Brachyuran megalops B	-	-	-	-	1	5	2	-	4	3
Brachyuran megalops D	-	-	-	-	-	-	1	0	0	1
Brachyuran megalops F	5	19	-	-	-	-	-	-	-	-
Callianassid sp. zoea I	-	-	8	-	-	12	48	15	67	4
Callianassid sp. zoea II	-	-	-	-	-	-	4	20	5	23
Callinectes similis	1	-	-	-	-	5	6	6	-	-
Eucalanus sp.	190	631	1,968	1,734	3,765	2,355	832	2,738	1,627	1,214
Latreutes sp. postlarvae	-	-	-	-	-	-	1	-	-	-

Table B7.(cont'd)

Species	Station									
	A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Arthropoda (cont'd)										
Latreutes sp. zoea	-	-	-	-	1	0	8	1	1	-
Leptochela sp.	3	-	3	1	2	-	3	13	-	8
Lucifer faxoni	4	35	41	9	428	294	1,326	1,356	548	396
Unidentified natantia	7	-	2	-	1	26	28	584	36	18
Ogyrides sp. postlarvae	8	7	24	1	31	-	6	4	-	3
Ogyrides sp. zoea	40	40	134	24	243	203	99	307	99	423
Pagurid megalops	29	2	12	10	38	1	-	-	1	3
Unidentified reptantian megalops	1	3	15	11	11	-	-	10	-	-
Portunid megalops	3	-	-	1	-	4	15	1	4	5
Porcellanid megalops	1	-	-	19	4	-	-	-	-	-
Processa sp. postlarvae	-	-	-	-	-	41	5	30	13	2
Reptantian zoea	54	42	157	218	201	782	1,040	2,569	668	160
Sergestid postlarvae	1	-	5	-	-	475	35	21	1	8
Squilla sp.	-	-	-	-	-	13	2	-	-	-
Stenopodid zoea	-	-	2	-	1	-	374	166	206	603
Trachypenaeus sp. postlarvae	11	19	25	10	8	120	50	21	60	40
Trachypenaeus sp. zoea	-	-	1	-	2	12	2	8	18	12
Upogebia sp. zoea	15	17	107	1	7	-	5	-	-	2
Xanthid megalops	1	-	-	-	-	-	-	-	-	-
Xiphopenaeus sp. zoea	3	-	2	2	1	13	10	25	36	33
	-	-	-	-	-	-	-	-	-	-
Mysidopsis bigelowi	3	7	4	-	17	2	16	38	57	1
Unidentified mysid	-	-	-	-	-	-	1	-	-	-
Ostracoda	-	-	-	-	-	-	7	-	-	-
Hemichordata	-	-	-	-	-	-	-	-	-	-
Oikopleura sp.	1	24	28	5	136	235	13	109	-	-
Thallacea	-	-	-	5	-	11	54	135	53	13
Chordata	-	-	-	-	-	-	-	-	-	-
Amphioxas sp.	-	-	-	-	-	-	-	11	-	8

Table B7.(cont'd)

Species	Station A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Chaetognatha	-	-	-	-	-	-	-	-	-	-
Sagitta sp.	828	1,035	2,250	886	3,882	2,180	3,091	3,617	6,113	3,984
Krohnitta sp.	-	7	13	5	75	196	145	211	189	81
Unidentified invertebrates	-	56	-	-	-	-	-	-	-	-
TOTALS	2,437	5,570	7,622	5,338	15,886	18,160	13,011	18,534	21,107	16,428

*could be either genus

Table B8. Taxa and densities (No./100m³) of fish and invertebrates collected during winter in the 0.505 mm mesh bongo net.

Species	Station A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Ophichthidae										
Myrophis punctatus	-	-	-	-	-	-	-	1	-	-
Clupeidae	2	-	2	1	-	10	41	46	1	5
Brevoortia sp.	-	1	-	-	-	5	5	16	1	5
Etrumeus teres	-	-	-	-	-	-	-	-	-	2
Sciaenidae	1	-	-	-	-	-	-	1	-	-
Leiostomus xanthurus	-	-	-	-	-	8	4	9	-	2
Micropogon undulatus	-	-	1	-	-	8	10	50	-	13
Gobiidae	-	-	-	-	-	4	-	1	-	-
Bothidae										
*Citharichthys/Etropus**	-	-	-	-	-	1	1	1	-	2
Etropus sp.	-	-	-	-	-	-	-	1	-	-
Unidentified fish	1	-	-	-	-	-	1	3	<1	-
Coelenterata	84	12	27	77	76	-	392	47	21	81
Annelida										
Unidentified polychaetes	-	-	-	-	-	-	1	1	-	-
Mollusca										
Bivalve meroplankton	-	-	19	-	-	-	-	3	2	-
Creseis sp.	-	-	-	-	-	-	-	-	12	14
Gastropod meroplankton	3	-	-	5	-	-	-	282	25	4
Arthropoda										
Amphipoda	3	-	-	29	7	-	6	112	11	55
Acartia tonsa	484	102	852	109	368	47	552	1,623	30	9
Labidocera	343	79	635	785	124	4,159	15,596	67,007	553	1,294
Sapphirina sp.	-	-	9	-	7	-	-	-	-	-
Temora sp.	1,386	96	4,036	2,281	40	369	822	833	58	424
Unidentified copepods	21	39	186	40	161	390	482	609	24	81
Acetes americanus	4	-	1	2	-	10	-	29	-	27
Brachyuran megalops A	1	-	1	1	1	20	3	36	2	-
Callinectes similis	-	-	-	-	-	-	-	3	-	-
Eucalanus sp.	17	4	-	22	2	275	591	938	22	67
Latreutes sp. postlarvae	-	-	-	-	-	-	-	2	-	-
Latreutes sp. zoea	-	-	-	-	-	-	1	-	-	-
Leptocheula sp.	-	-	-	-	-	4	-	1	-	-
Lucifer faxoni	-	-	-	-	-	11	-	-	2	4

Table B8 .(cont'd)

Species	Station A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Ogyrides sp. postlarvae	-	-	-	-	-	1	-	-	-	5
Ogyrides sp. zoea	-	-	-	-	-	-	3	7	-	-
Pagurid megalops	-	-	2	-	1	7	3	46	1	2
Unidentified reptantian megalops	-	-	-	-	-	12	3	56	-	10
Portunid megalops	-	-	-	1	-	2	3	23	-	7
Reptantian zoea	152	12	109	33	17	1,235	2,980	3,101	306	1,052
Sergestid postlarvae	1	-	-	-	-	8	-	19	4	4
Stenopodid zoea	3	-	7	3	-	1	1	15	-	14
Trachypenaeus sp. postlarvae	-	-	-	-	-	2	-	1	-	-
Upogebia sp. zoea	-	-	-	-	-	-	1	-	-	-
Mysidopsis bigelowi	44	6	37	6	41	128	6	28	<1	15
Unidentified mysid	1	2	1	3	2	-	-	8	<1	6
Ostracoda	-	-	-	-	1	-	-	47	4	10
Chordata										
Amphioxas sp.	-	-	9	-	-	-	-	1	-	-
Chaetognatha										
Sagitta sp.	3,038	1,133	3,366	1,483	1,804	937	7,772	11,060	726	720
Krohnitta sp.	3	1	-	-	-	-	-	-	-	9
Unidentified invertebrates	13	7	24	13	-	-	26	-	3	-
TOTALS	5,605	1,494	9,324	4,894	2,652	7,654	29,306	86,067	1,808	3,943

* could be either genus

Table B9. Taxa and densities (ave no/tow) of fish and invertebrates collected during the spring in the neuston net (0.505 mm mesh).

Species	Station									
	A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Opichthidae	-	-	-	-	1	-	-	-	-	-
Myrophis punctatus	-	-	-	-	-	-	-	-	-	<1
Clupeidae	2	4	9	3	<1	-	<1	-	-	3
Brevoortia sp.	2	2	<1	<1	1	-	<1	-	-	<1
Engraulidae	10	4	6	4	1	5	8	10	2	23
Anchoa sp.	-	-	-	-	1	-	-	1	-	-
Anchoa hepsetus	2	1	1	1	-	-	1	-	1	1
Anchoa mitchilli	39	37	129	31	20	16	4	29	55	33
Atherinidae	1	1	6	1	1	-	-	-	-	-
Lobotidae										
Lobotes surinamensis	-	-	-	-	<1	-	-	-	-	-
Pomadasyidae	-	-	1	2	2	1	1	-	-	1
Sparidae	-	-	6	2	5	1	3	<1	<1	2
Lagodon rhomboides	-	1	-	-	-	-	-	-	-	-
Sciaenidae	-	1	4	1	1	2	3	2	2	1
Cynoscion sp.	-	-	-	-	-	1	<1	<1	2	-
Cynoscion ?arenarius	-	-	<1	<1	-	-	-	-	-	-
Menticirrhus sp.	<1	-	1	-	1	-	1	2	<1	2
Pogonias cromis	<1	<1	-	-	-	-	-	-	<1	2
Mugilidae										
Mugil sp.	-	-	-	-	-	-	-	-	-	<1
Mugil ?cephalus	-	<1	-	-	-	-	1	-	-	-
Gobiidae	-	-	-	-	-	-	1	-	3	-
?Microgobius	-	-	-	-	-	-	-	2	-	-
Stromateidae										
Peprilus alepidotus	-	-	-	<1	-	-	-	-	-	-
Unidentified fish	271	498	617	198	1,951	313	10	36	94	262
Annelida										
Unidentified polychaetes	-	7	3	-	-	3	5	-	-	11
Creseis sp.	-	-	-	-	-	-	-	-	-	699
Gastropod meroplankton	-	-	-	8	-	-	8	-	<1	-
Amphipoda	-	-	-	-	<1	3	-	11	5	-
Cladocerans	5	-	3	35	69	19	3	-	-	-
Acartia tonsa	1,832	167	4,815	2,870	4,471	72	-	1,107	75	215
Labidocera	795	980	553	1,262	3,416	48	75	338	27	1,537
Sapphirina sp.	-	3	3	3	11	-	-	-	<1	-

Table B9. (cont'd)

Species	Station A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Arthropoda (cont'd)										
Temora sp.	-	8	3	3	16	51	-	5	11	-
Unidentified copepods	183	31	19	1,020	733	19	547	69	48	75
Alpheid zoea	3	-	-	-	-	-	-	-	-	-
Anomuran megalops	-	-	-	-	-	-	-	-	-	<1
Brachyuran megalops A	-	-	-	-	<1	1	-	1	1	2
Callinectes similis	-	-	-	<1	-	<1	-	1	2	1
Eucalanus sp.	-	-	-	-	-	16	-	-	16	11
Lucifer faxoni	-	5	19	5	105	196	283	307	150	86
Ogyrides sp. zoea	-	-	-	-	1	-	-	1	2	2
Pagurid megalops	<1	-	-	-	<1	-	-	-	<1	-
Unidentified reptantian megalops	-	-	-	-	-	-	-	<1	-	-
Palaemonidae	8	16	92	9	63	-	10	-	1	3
Reptantian zoea	19	3	5	53	221	1,299	189	639	569	661
Sergestid postlarvae	13	88	99	3	89	-	<1	-	-	<1
Stenopodid zoea	-	-	-	-	-	1	1	<1	-	2
Upogebia sp. postlarvae	-	-	-	-	-	10	8	1	-	-
Xanthid megalops	-	-	1	-	-	-	-	-	<1	<1
Isopoda	-	-	-	-	<1	-	<1	-	-	<1
Mysidopsis bigelowi	-	-	-	-	<1	-	2	2	2	3
Hemichordata										
Thallacea	-	-	-	-	-	-	8	11	-	-
Chaetognatha										
Sagitta sp.	8	4	3	16	-	1,331	1,579	1,193	2,048	2,892
Krohnitta sp.	-	-	-	-	-	-	-	-	5	-
Unidentified invertebrates	-	1	-	16	11	24	-	-	-	11
TOTALS	3,192	1,860	6,397	5,545	11,191	3,432	2,751	3,768	3,121	6,541

Table B10. Taxa and densities (ave no/tow) of fish and invertebrates collected during summer in the neuston net (0.505 mm mesh).

Species	Station A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Anguilliformes	-	-	-	-	-	-	-	-	1	-
Clupeidae	247	1	104	124	36	<1	4	3	5	9
Opistonema oglinum	<1	-	1	9	5	-	1	1	1	6
Engraulidae	170	56	386	33	27	21	22	30	143	47
Anchoa sp.	15	18	25	14	6	2	2	1	4	2
Anchoa hepsetus	6	16	31	25	5	5	1	-	<1	-
Anchoa mitchilli	-	1	5	<1	<1	-	-	-	-	-
Engraulis eurystole	-	6	-	1	-	-	-	-	-	<1
Atherinidae	1	-	2	-	<1	-	-	-	-	<1
Membras martinica	2	3	-	1	-	-	-	-	-	-
Sygnathidae										
Sygnathus louisianae	-	<1	-	-	-	<1	-	-	-	<1
Carangidae	2	<1	5	20	13	8	30	49	13	127
Chloroscombrus chrysurus	-	-	2	14	7	5	3	9	10	7
Selene vomer	-	-	-	-	-	-	-	<1	-	-
Seriola rivoliana	-	-	-	-	-	<1	-	-	-	-
Sciaenidae	<1	-	24	-	<1	-	-	-	<1	-
*Cynoscion/Bairdiella**	-	-	11	59	32	40	-	7	19	-
Bairdiella sp.	1	1	-	-	-	-	-	-	-	-
Cynoscion sp.	18	3	-	-	-	-	44	3	4	12
Menticirrhus sp.	2	<1	3	<1	3	7	3	2	5	7
Ephippidae										
Chaetodipterus faber	-	-	-	-	-	4	3	21	81	7
Blennidae	-	-	1	-	-	-	<1	-	-	-
Chasmodes bosquianus	<1	-	1	-	-	-	-	-	-	<1
Hypsoblennius hentzi	-	<1	-	-	-	-	-	-	-	-
Gobiidae	-	1	-	1	<1	<1	-	<1	2	1
Scombridae	<1	-	-	4	<1	-	-	-	-	-
Scomberomorus cavalla	-	-	-	-	-	-	<1	<1	-	-
Scomberomorus maculatus	-	-	-	-	-	-	1	1	1	1
Stromateidae										
Peprilis sp.	-	-	-	-	-	-	-	1	-	1
Scorpaenidae										
Scorpaena sp.	-	-	-	-	-	-	-	-	<1	-

Table B10 (cont'd)

Species	Station									
	A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Bothidae	-	-	-	-	-	<1	-	-	-	-
Citharichthys sp.	-	-	-	-	-	4	-	19	3	-
Etropus sp.	-	-	-	-	-	-	11	11	1	<1
Cynoglossidae										
Symphurus sp.	-	-	-	<1	-	15	5	14	9	9
Tetraodontidae										
Spaeroides sp.	-	-	-	-	-	-	<1	1	1	0
Unidentified fish	237	20	38	24	5	2	<1	2	5	3
Coelenterata	107	-	153	415	398	4,548	6,312	6,946	6,373	3,478
Unidentified coelenterate polyp	-	-	-	-	-	11	-	11	-	-
Annelida										
Polychaete A	-	-	-	-	-	193	42	86	352	85
Polychaete B	-	-	-	-	-	59	-	-	21	-
Polychaete D	-	16	-	43	16	499	3,583	5,300	23,520	4,523
Mollusca										
Atlanta sp.	-	-	-	-	-	5	-	-	-	-
Bivalve meroplankton	-	-	-	-	-	-	21	-	-	-
Cephalopoda	-	-	-	-	-	-	<1	1	<1	-
Creseis sp.	-	-	-	-	-	11	-	43	11	-
Gastropod meroplankton	5	21	8	123	21	978	1,062	290	856	160
Arthropoda										
Amphipoda	-	-	-	-	-	290	41	97	459	139
Cladocerans	510	-	148	122	64	1,360	27,708	12,559	1,001	896
Acartia tonsa	-	-	2,109	590	1,828	231	-	3	-	-
Labidocera	2,741	1,537	4,873	2,146	6,188	462	750	408	317	191
Sapphirina sp.	-	-	-	-	5	11	-	21	-	11
Temora sp.	-	-	-	-	-	64	375	225	62	75
Unidentified copepods	473	930	184	650	328	494	604	698	2,622	526
Cumaceans	-	-	-	-	-	-	-	11	-	-
Acetes americanus	-	-	-	-	-	5	<1	1	3	3
Albunea sp. zoea	-	-	-	-	-	13	-	2	-	-
Alpheid zoea	-	-	1	1	-	1	-	1	-	-

Table B10 (cont'd)

Species	Station A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Arthropoda (cont'd)										
Brachyuran megalops A	46	113	778	32	5	290	144	155	188	796
Brachyuran megalops B	-	-	-	3	<1	234	51	32	356	132
Brachyuran megalops C	-	-	-	-	-	-	-	-	65	-
Brachyuran megalops D	-	-	-	-	-	35	15	2	96	31
Brachyuran megalops E	-	-	-	-	-	-	1	-	-	-
Callianassid sp. zoea I	1	1	1	-	-	4	6	12	8	46
Callianassid sp. zoea II	-	-	<1	<1	-	1	8	2	-	9
Callinectes similis	2	2	3	5	-	-	-	<1	-	-
Eucalanus sp.	-	-	5	-	-	688	1,041	989	312	801
Latreutes sp. postlarvae	-	-	-	-	-	1	7	7	-	10
Latreutes sp. zoea	1	-	-	1	1	8	10	6	24	6
Leander sp. zoea	-	-	-	-	-	<1	3	3	-	2
Leptochela sp.	-	-	-	-	<1	36	2	10	7	4
Lucifer faxoni	54	21	21	450	-	48	-	21	-	-
Ogyrides sp. postlarvae	1	-	-	1	<1	<1	4	3	5	1
Ogyrides sp. zoea	13	1	5	58	6	243	124	85	289	206
Pagurid megalops	<1	-	1	-	-	1	1	-	<1	<1
Unidentified reptantian megalops	-	-	64	53	-	69	-	504	785	-
Portunid megalops	<1	-	1	-	-	5	1	5	10	3
Palaemonidae	-	7	5	3	1	1	-	1	-	-
Processa sp. postlarvae	-	-	-	-	-	2	1	<1	-	-
Reptantian zoea	5,177	387	1,282	1,747	1,376	548	1,854	1,494	1,541	1,625
Sergestid postlarvae	-	2	9	16	5	10	2	-	-	9
Squilla sp.	-	-	-	-	-	3	2	11	4	76
Stenopodid zoea	4	-	2	8	2	288	120	80	67	79
Trachypenaeus sp. postlarvae	-	-	-	-	-	1	18	8	3	9
Trachypenaeus sp. zoea	-	-	<1	-	-	47	46	18	45	14
Upogebia sp. postlarvae	-	-	-	-	-	<1	-	-	-	-
Upogebia sp. zoea	-	-	<1	3	-	2	5	3	-	3
Xanthid megalops	<1	-	-	11	-	<1	-	-	-	-

Table B10 (cont'd)

Species	Station									
	A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Arthropoda (cont'd)										
Xiphopenaeus sp. postlarvae	-	-	-	-	-	-	1	-	-	-
Xiphopenaeus sp. zoea	-	-	-	-	-	118	235	112	279	63
Isopoda	-	-	-	-	-	<1	-	-	-	-
Mysidopsis ?bahia	-	-	-	-	<1	-	-	-	-	-
Mysidopsis bagelowi	16	9	8	24	4	4	14	7	27	3
Neomysis americana	-	-	1	-	-	2	-	-	-	-
Hemichordata										
Oikopleura sp.	123	1,198	2,019	2,433	1,021	-	-	-	21	-
Thallacea	-	-	-	-	-	1,725	896	3,279	3,205	2,928
Chaetognatha										
Sagitta sp.	-	43	5	45	16	268	312	322	179	486
Krohnitta sp.	-	-	-	-	-	32	62	193	-	96
Unidentified invertebrates	-	-	-	-	-	-	42	-	-	-
TOTALS	9,975	4,414	12,325	9,312	11,424	14,063	45,655	34,242	43,421	17,764

*could be either genus.

Table B11. Taxa and densities (ave no/tow) of fish and invertebrates collected during fall in the neuston net (0.505 mm mesh).

Species	Station									
	A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Clupeidae	<1	-	-	<1	1	<1	4	2	-	<1
Harengula pensacolae	1	-	-	-	-	-	<1	-	-	<1
Opistonema oglinum	-	-	1	<1	-	1	-	1	2	<1
Sardinella sp.	-	<1	-	-	-	4	<1	1	-	1
?Clupeidae	-	-	-	2	-	-	-	4	6	-
Engraulidae	-	-	-	1	-	1	6	3	1	2
Anchoa sp.	-	-	-	-	-	-	-	1	<1	<1
Anchoa hepsetus	-	-	-	-	-	-	1	1	1	2
Anchoa mitchilli	<1	-	-	-	-	<1	-	-	-	-
Engraulis eurystole	-	-	-	-	-	-	-	1	1	-
Atherinidae	-	-	-	-	-	-	-	-	-	<1
Membras martinica	-	-	-	-	<1	-	-	-	-	-
Carangidae	-	-	-	2	2	14	21	5	10	5
Chloroscombrus chrysurus	-	-	<1	1	<1	1	6	2	<1	-
Seriola sp.	-	-	-	-	-	<1	-	-	-	-
Sciaenidae	-	<1	1	<1	1	-	-	1	4	2
*Cynoscion/Bairdiella**	-	-	-	-	-	1	-	-	1	4
Bairdiella sp.	-	-	-	-	-	4	6	1	<1	2
Cynoscion sp.	-	-	-	<1	<1	6	10	1	2	-
Cynoscion ?arenarius	-	-	-	1	-	-	-	-	1	2
Cynoscion ?nebulosus	-	-	1	-	<1	-	-	-	1	1
Cynoscion ?nothus	-	-	-	-	-	-	-	-	5	3
Leiostomus xanthurus	-	-	-	-	-	-	-	-	<1	-
Menticirrhus sp.	1	-	-	<1	-	2	9	2	-	1
Menticirrhus ?americanus	-	-	-	-	<1	-	-	-	-	-
Menticirrhus ?littoralis	-	-	-	-	<1	-	1	1	-	1
Micropogon undulatus	<1	1	-	-	-	2	5	1	2	5
Ephippidae										
Chaetodipterus faber	-	-	-	-	-	-	-	-	<1	-
Blenniidae	-	-	1	-	-	-	<1	<1	-	-
Microdesmidae										
Microdesmus sp.	-	-	-	-	-	-	-	<1	-	-

Table B11 (cont'd)

Species	Station									
	A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Trichiuridae										
Trichiurus lepterus	-	<1	-	-	-	-	-	-	-	-
Scombridae										
Scomberomorus maculatus	-	-	-	-	-	1	1	-	-	<1
Triglidae	-	-	-	-	-	-	<1	-	-	-
Bothidae	-	-	1	-	-	-	<1	-	-	-
*Citharichthys/Etropus**	-	-	-	-	-	-	-	-	1	-
Etropus sp.	-	-	-	-	-	1	-	-	-	<1
Soleidae	-	-	-	-	-	-	<1	-	<1	-
Cynoglossidae										
Symphurus sp.	-	-	-	-	-	-	<1	-	<1	<1
Unidentified fish	-	-	2	540	16	43	62	234	37	63
Coelenterata	-	8	24	21	16	96	-	35	29	5
Annelida										
Polychaete A	-	-	-	-	-	11	-	-	-	-
Polychaete D	13	-	-	12	17	-	-	-	5	-
Mollusca										
Atlanta sp.	-	1	-	-	-	-	5	-	-	-
Bivalve meroplankton	-	-	-	-	-	-	-	5	-	3
Creseis sp.	7	1	16	56	180	107	134	134	75	80
Donax sp.	-	-	-	-	11	-	-	-	-	-
Gastropod meroplankton	1	3	8	-	15	11	107	176	115	29
Arthropoda										
Unidentified crustacean	16	-	-	4	<1	-	1	-	-	-
Amphipoda	-	1	-	7	18	70	251	161	177	61
Cladocerans	-	-	-	-	-	-	5	-	-	-
Labidocera	1,596	409	341	292	1,269	811	1,180	554	640	1,053
Sapphirina sp.	-	7	-	-	7	5	5	-	-	-
Temora sp.	-	16	16	11	12	225	451	254	912	684
Unidentified copepods	87	928	797	100	552	1,279	1,578	1,197	1,870	815
Acetes americanus	1	11	8	-	-	798	77	59	19	19
Brachyuran megalops A	256	29	18	40	49	48	579	104	95	106
Brachyuran megalops B	1	-	<1	1	<1	-	-	1	1	2
Brachyuran megalops C	-	-	-	-	-	<1	-	-	-	-
Brachyuran megalops F	1	-	-	-	-	-	-	-	-	-

Table B11 (cont'd)

Species	Station A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Arthropoda (cont'd)										
Callianassid sp. zoea I	-	-	2	-	-	3	21	3	12	7
Callianassid sp. zoea II	-	-	-	-	-	-	1	<1	3	9
Callinectes similis	-	-	1	-	-	1	4	-	<1	2
Eucalanus sp.	164	468	1,720	752	935	870	434	865	547	279
Latreutes sp. postlarvae	-	-	<1	-	-	-	-	-	<1	-
Latreutes sp. zoea	1	-	<1	-	<1	1	-	-	-	-
Leander sp.	-	-	-	-	-	-	<1	-	-	-
Leander sp. zoea	-	-	-	-	<1	-	-	-	-	-
Leptochela sp.	1	-	1	3	2	-	2	3	1	2
Leptochela sp. postlarvae	-	-	-	-	<1	-	-	-	-	-
Lucifer faxoni	16	13	75	20	511	75	785	311	220	85
Unidentified natantia	-	<1	1	-	<1	11	28	37	20	29
Ogyrides sp. postlarvae	4	1	10	<1	6	1	-	-	<1	<1
Ogyrides sp. zoea	62	30	150	7	385	2	204	148	74	250
Pagurid megalops	157	4	18	12	11	-	-	<1	2	3
Unidentified reptantian megalops	14	1	8	4	2	-	-	-	-	1
Portunid megalops	<1	<1	-	-	<1	-	22	-	<1	2
Porcellanid megalops	-	-	-	-	-	-	-	-	<1	-
Processa sp. postlarvae	-	-	-	1	1	2	2	9	5	2
Reptantian zoea	68	23	133	293	120	247	1,464	591	131	78
Sergestid postlarvae	11	<1	<1	2	-	55	4	1	-	2
Squilla sp.	-	-	-	1	-	<1	-	1	1	1
Stenopodid zoea	1	2	-	-	6	206	715	85	102	281
Sicyonia dorsalis postlarvae	-	-	-	-	-	-	-	-	-	<1
Trachypenaeus sp. postlarvae	1	4	2	-	1	17	11	3	6	2
Trachypenaeus sp. zoea	-	-	<1	1	1	2	4	4	4	2
Upogebia sp. zoea	22	10	30	2	6	-	3	-	-	-
Xiphopenaeus sp. zoea	1	1	1	-	2	5	18	8	14	12
Mysidopsis bigelowi	-	1	1	-	<1	1	6	15	25	-
Unidentified mysid	-	-	<1	-	-	-	-	-	-	-

Table B11 (cont'd)

Species	Station A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Hemichordata										
Oikopleura sp.	4	5	5	-	3	139	3	21	-	3
Thallacea	-	-	-	4	-	16	21	11	16	19
Chordata										
Amphioxas sp.	-	-	-	-	-	-	5	-	-	-
Chaetognatha										
Sagitta sp.	209	341	1,083	936	926	521	1,536	792	2,522	811
Krohnitta sp.	-	-	3	-	3	113	94	67	75	13
Unidentified invertebrates	-	-	-	4	<1	-	-	-	-	-
TOTALS	2,717	2,320	4,477	3,132	5,088	5,869	9,960	5,980	7,932	4,910

*Could be either genus.

Table B12. Taxa and densities (ave no/tow) of fish and invertebrates collected during the winter in the neuston net (0.505 mm mesh).

Species	Station A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Clupeidae	9	4	13	73	3	5	28	11	4	5
Brevoortia sp.	<1	1	1	1	-	1	3	7	1	1
Sygnathidae										
Sygnathus louisianae	<1	-	-	-	-	-	-	-	-	-
Sparidae										
Lagodon rhomboides	<1	-	-	1	-	-	-	-	-	-
Sciaenidae	<1	<1	-	-	-	-	-	<1	1	-
Leiostomus xanthurus	-	<1	-	1	-	1	2	1	-	1
Micropogon undulatus	-	-	-	-	-	2	10	16	3	4
Gobiidae	1	-	<1	<1	-	-	1	<1	1	<1
Bothidae	-	-	-	-	-	-	-	2	-	-
*Citharichthys/Etropus**	-	-	-	-	-	-	<1	-	-	-
Unidentified fish	<1	-	-	-	<1	<1	-	1	-	-
Coelenterata	159	709	537	521	269	16	208	-	64	102
Annelida										
Unidentified polychaetes	-	-	1	-	-	-	-	-	11	5
Mollusca										
Gastropod meroplankton	-	-	-	-	-	-	83	-	-	-
Amphipoda	-	-	-	-	-	-	-	-	252	150
Cladocerans	-	-	-	-	-	-	-	-	-	5
Acartia tonsa	2,080	1,761	1,794	1,146	3,494	1,213	958	750	134	11
Labidocera	5,251	8,118	14,659	8,812	129	4,088	44,292	47,750	3,198	3,688
Sapphirina sp.	31	11	26	-	-	-	-	-	-	-
Temora sp.	848	203	303	208	-	212	1,042	792	279	940
Unidentified copepods	102	755	21	437	462	340	667	292	118	365
Acetes americanus	-	-	3	4	-	-	3	2	1	<1
Brachyuran megalops A	2	1	1	1	-	1	19	18	6	3
Brachyuran megalops B	-	-	-	-	-	-	-	-	1	-
Callinectes similis	-	-	-	-	-	-	-	1	-	-
Eucalanus sp.	-	-	21	-	-	104	875	292	150	510
Latreutes sp. zoea	-	-	-	-	-	-	1	-	-	-
Leptochela sp.	-	-	-	<1	-	-	2	1	1	1

Table B12 (cont'd)

Species	Station									
	A2	A6	A8	A10	A14	B2	B6	B8	B10	B14
Arthropoda (cont'd)										
Lucifer faxoni	-	-	-	-	-	3	-	-	27	5
Ogyrides sp. zoea	-	-	-	-	-	-	2	1	-	-
Pagurid megalops	1	1	5	4	5	-	19	10	2	1
Unidentified reptantian megalops	-	-	-	-	-	-	1	-	-	-
Portunid megalops	<1	-	-	<1	-	1	2	5	1	1
Palaemonidae	-	-	-	<1	-	-	1	-	-	-
Reptantian zoea	589	2,320	1,341	1,104	537	513	3,125	1,167	1,532	1,091
Sergestid postlarvae	5	7	4	<1	1	2	4	3	1	1
Squilla sp.	-	-	-	-	-	-	1	-	-	<1
Stenopodid zoea	1	3	14	37	1	4	1	4	8	8
Upogebia sp. zoea	-	-	-	-	-	-	<1	-	-	-
Isopoda	-	-	-	-	-	-	<1	1	11	<1
Mysidopsis bigelowi	759	14	129	15	105	61	<1	4	4	3
Unidentified mysid	1	4	2	2	-	-	3	2	7	6
Ostracoda	-	42	41	21	-	-	-	-	43	16
Hemichordata										
Thallacea	83	-	-	-	-	-	-	-	11	-
Chordata										
Amphioxas sp.	-	-	-	-	-	-	-	-	-	5
Chaetognatha										
Sagitta sp.	6,062	1,284	5,060	1,666	3,580	577	8,583	3,896	940	628
Krohnitta sp.	-	-	-	-	-	-	42	-	21	11
Unidentified invertebrates	21	-	5	21	-	3	-	-	-	-
TOTALS	16,004	15,237	23,980	14,074	8,586	7,147	59,978	55,029	6,839	7,567

*Could be either genus.

APPENDIX C

SUPPLEMENTARY INFORMATION ON HYDROLAB SYSTEM

OPERATING INSTRUCTIONS

(ABBREVIATED, OCTOBER 10, 1978)

HYDROLAB SYSTEM 8000

HYDROLAB

HYDROLAB CORPORATION
P.O. BOX 9406
AUSTIN, TEXAS 78766
Telephone (512) 837-2050

INDEX

OPERATING INSTRUCTIONS, HYDROLAB SYSTEM 8000

ABBREVIATED OPERATING INSTRUCTIONS FOR THE SYSTEM 8000

1.0 SYSTEM COMPONENTS

In its basic configuration the System 8000 consists of the following components:

1.1) DATA TRANSMITTER...Submersible instrument package which contains sensors and analog circuits for measuring as many as six water quality parameters including temperature, depth, dissolved oxygen, conductance, pH and oxidation-reduction-potential (ORP).

1.2) DATA CONTROL UNIT...Surface or deck unit which contains power supply and transmitter control circuits, a single operating control, and a digital display for immediate read-out of selected parameters.

1.3) DATA BUS CABLE...Underwater cable which connects the Data Transmitter to the Data Control Unit. It also provides an electrical and mechanical connection to the Transmitter Carrier.

1.4) TRANSMITTER CARRIER...A high-strength, clear LEXAN™ cylinder which provides mechanical protection for the Data Transmitter during operation. It incorporates a motor-driven, magnetically coupled impeller which assures proper circulation through the sensor chamber.

1.5) RECHARGEABLE BATTERY PACK...A 12 volt, 12 ampere-hour rechargeable battery (gelled electrolyte) which includes a charger, carrying case and an interconnect cable for connecting the battery to the Data Control Unit during operation or calibration.

1.6) ACCESSORY CASE...A durable plastic carrying case which contains various supply and maintenance items, tools, and calibration accessories required for routine maintenance and calibration of the system. Note: Only those items which are pertinent to the measuring systems installed in your Data Transmitter are provided with the accessory case.

2.0 INITIAL PREPARATION

Your system has undergone a thorough calibration and testing procedure immediately prior to shipment. There are a few precautions that should be taken however, before you attempt to connect the system components for operation.

2.1) BATTERY CHARGE...The battery should be fully charged when you receive it. It is advisable however to charge the battery anyway for a period of 48 hours to avoid an unexpected loss of power during operation. (See attached Charging Manual).

2.2) UNDERWATER CONNECTORS...Both mating surfaces of the underwater connectors should be lightly lubricated before you attempt to mate them. In order to prevent unnecessary abrasion of the sealing surfaces of any underwater connector pair, a very light coating of the underwater connector lubricant (supplied in the Accessory Case) should be applied to both sealing surfaces.

2.3) TRANSMITTER STORAGE CUP...The Data Transmitter has been shipped to you with tapwater contained in the "Storage-Cup" which is threaded onto the sensor end. If water has leaked out during shipment, the sensors may be dry and require soaking for a few hours prior to calibration. In this event, remove the Storage Cup and fill it to the brim with tapwater. Reinstall the cup which should, when tightly sealed, trap a small air bubble. It is a good practice to keep the Storage Cup filled with fresh tapwater and installed on the Data Transmitter when it is not in service.

3.0 CONNECTING THE SYSTEM COMPONENTS

3.1) DATA TRANSMITTER TO DATA BUS CABLE...Connect the Data Transmitter to the Data Bus Cable by carefully aligning and mating the two halves of the 12-pin connector pair. This operation often requires considerable force and care should be taken to expell any air that may be trapped within the connector cavity.

3.2) DATA BUS CABLE TO DATA CONTROL UNIT...Connect the Data Bus Cable to the Data Control Unit by rotating the metal locking ring on the cable connector clockwise until it is snap-locked in place. The connectors on the case are plainly identified with adhesive labels to assure proper connection of the various cables. The "Data Bus Cable" connector is so marked.

3.3) BATTERY PACK TO DATA CONTROL UNIT...Connect the Rechargeable Battery Pack to the Data Control Unit with the interconnect cable supplied in the battery case. The connectors on either end are identical and are of the snap-lock type. Attach the battery cable to the connector marked "12 VOLTS DC INPUT".

3.4) TRANSMITTER CARRIER TO DATA BUS CABLE...For purposes of system calibration, the Transmitter Carrier SHOULD NOT be connected to the Data Bus Cable. After calibration has been completed, install the Data Transmitter in the Transmitter Carrier and connect the Transmitter Carrier to the Data Bus Cable according to instructions given in 7.2).

4.0 GENERAL CALIBRATION REMARKS

As a general statement regarding calibration of the System 8000, the procedures are simple, straight-forward and easily implemented with the aid of a "CALIBRATION-CUP" which is supplied in the Accessory Case, but...if you are to expect good results in the field, you must perform all calibration checks, which are pertinent to the measuring systems that are installed in the Data Transmitter, and TAKE NO SHORTCUTS. Obviously, any calibration errors are reflected in the accuracy of all subsequent measurements.

4.1) FREQUENCY OF CALIBRATION...A complete calibration check should be accomplished before going to, and after returning from the field. This dual calibration procedure will afford judgment as to drift in calibration due to sensor fouling and to the frequency and type of sensor maintenance required between field operations.

Because of a multitude of variables encountered under differing field conditions, there is no rule-of-thumb in establishing: 1) the length of time that a system may be employed unattended in a monitoring application or 2) the extent of cleaning and maintenance required between field operations. These judgments are made on a case-by-case basis and should be expected to change in time.

4.2) CALIBRATION CONDITIONS...The calibration procedures should be carried out in a place where ambient conditions are under control and where there is a readily available supply of distilled water, reliable calibration standard solutions and maintenance items. Generally, the laboratory is best suited for the purpose but a field office or closed-in shelter will suffice if necessary.

4.3) REQUIRED MATERIALS...Depending upon the sensor systems which are installed in the Data Transmitter, you will need the following items in calibrating your system: (See section 1.6)

1) Calibration Cup (supplied in Accessory Case)

2) Two reliable KCl standard solutions (known conductance at 25^{o}C. See section 6.2)
3) Two freshly prepared pH buffer solutions. Generally pH 7.0 and either pH 4.0 or 9.18 are used, depending upon the measuring assignment.
4) One or two Redox standards (solutions which exhibit known redox potentials for platinum vs. Ag-AgCl electrodes. See section 6.3)
5) Distilled Water (approx. one liter)
6) Absorbent tissue (Kim-wipe or equivalent)
7) Two screwdrivers (supplied in Accessory Case)

4.4) PRIOR TO CALIBRATION...At least one hour prior to calibrating the system (preferably the night before), take the following preparatory steps.

1) Remove the "Storage-Cup" from the Data Transmitter.
2) Remove the protective guard from the dissolved oxygen sensor.
3) Install the "Calibration-Cup" on the Transmitter and fill to the brim with tapwater.
4) Seal the Calibration Cup with the soft plastic cap and store the transmitter, calibration standards, and the distilled water at constant room temperature for at least one hour in order to bring the various sensors, temperature compensating elements, and the calibration solutions into thermal equilibrium (within a few degrees).

5.0 CALIBRATION PROCEDURE

After having allowed a minimum of one hour for equilibration, the time required for calibrating all systems should be less than ten minutes.

Please follow the instructions for calibrating those systems installed in your Transmitter in the sequence that they are listed.

5.1) CALIBRATION ADJUSTMENTS...All required calibration controls are located in the "TOP HEADER" of the Transmitter. (Please refer to the diagram shown on the Transmitter insert). Make any necessary adjustment in the following manner:

1) Using the large screwdriver remove the appropriate "seal-screw" for the parameter being adjusted.
2) Invert the Transmitter and allow a minute or two for equilibration. (sensor-end-up)
3) Insert the small screwdriver through the access hole and adjust the calibration control in the direction which brings the meter reading into agreement with the value of the standard solution being employed.
4) When the meter stabilizes at the desired value, remove the screwdriver and replace the seal-screw tightly. Note: Make certain that the sealing area around the access hole is absolutely clean before installing the seal-screw.

IMPORTANT...The seal-screw must be tightened securely, in order to prevent accidental flooding of the Transmitter. NEVER partially install a seal-screw with the intention of tightening all screws later. This practice, though sometimes expedient, will invite an unnecessary disaster.

5.2) DISSOLVED OXYGEN CALIBRATION...The Dissolved Oxygen system is the first to be calibrated since the water that has been stored in the Calibration Cup is used to maintain control of the temperature inside the cup. The calibration standard is "water saturated air at the temperature inside the calibration cup." (Please refer to the oxygen solubility table, section <u>6.1</u>).

From the oxygen solubility table, values of oxygen at Standard Pressure (760mm) are obtained for temperatures between 0 and 35°C. Referring to this table and knowing: 1) the temperature inside the Calibration Cup, and 2) the local barometric pressure, the proper dissolved oxygen calibration setting can be calculated by:

$$\underline{\text{D.O. Setting}} = \frac{\text{local pressure}}{760} \times (\text{table value at cup temperature})$$

For example: cup temperature = 21.2°C (from read-out)
Table value = 8.65 (from solubility table)
local pressure = 710mm (from barometer)

$$\underline{\text{D.O. Setting}} = \frac{710}{760} \times 8.65 = \underline{8.08\text{ppm}}\ (\text{mg/l})$$

To calibrate the dissolved oxygen system, proceed as follows:

1) Record the local barometric pressure. If you don't have a barometer, the equivalent pressure may be estimated from your altitude by recalling that

atmospheric pressure drops from standard sea-level pressure (760mm Hg) at the approximate rate of 2.5mm for every 100 feet of elevation. Therefore the approximate atmospheric pressure at an altitude of 1240 feet for example, would be:

<u>Local Atmospheric Pressure</u> = 760 - (2.5 x 12.4)

or <u>729mm Hg</u>

2) Turn the "FUNCTION SELECT" knob on the Data Control unit to the DISSOLVED OXYGEN position.
3) Referring to the "TOP HEADER" diagram on the Transmitter insert, remove the DISSOLVED OXYGEN seal-screw.
4) With the sensor-end-up remove the soft plastic cap from the Calibration Cup.
5) Pour out enough water to bring the water level in the cup approximately one inch from the lip. This will expose the dissolved oxygen membrane.
6) Using the corner of the Kim-wipe tissue, carefully blot any water droplets from the membrane and quickly cover the cup with the <u>hard</u> plastic cap. It is important not to seal the cup with the <u>soft</u> plastic cap since the membrane must remain at atmospheric pressure during the calibration process.
7) Clamp or hold the Transmitter in the inverted position for approximately <u>two</u> minutes or until the dissolved oxygen reading on the display stabilizes.
8) When the dissolved oxygen reading is no longer changing, adjust the FUNCTION SELECT knob to the "TEMPERATURE" position and record the temperature reading on the display.

9) Referring to the solubility table, and the previously recorded barometric pressure, calculate the proper "DISSOLVED OXYGEN SETTING".

10) Turn the control knob to the "DISSOLVED OXYGEN position and make any required calibration adjustment in accordance with the instructions given in section 5.1) CALIBRATION ADJUSTMENT. Note: It is important not to disturb the water in the cup during this procedure. The membrane must be free of any water droplets which will cause a low reading.

11) Make certain that the reading remains stable after adjustment before resealing the dissolved oxygen access-hole.

12) This completes the Dissolved Oxygen System Calibration.

5.3) CONDUCTIVITY CALIBRATION...The Conductivity system is calibrated using at least two prepared KCl solutions with known conductance at 25°C. Please refer to the table in section 6.2). Depending upon the full-scale range of the conductivity system in your transmitter, select two standard solutions with values of approximately one third and two thirds of the range. The range of your conductivity system is shown on the transmitter insert.

To calibrate the conductivity system, proceed as follows:

1) With the Calibration Cup installed on the transmitter, rinse the cup and sensor chamber by half filling the cup with distilled water, installing the soft plastic cap, and shaking vigorously for about 10 seconds to dislodge any salt particles that may be present.

2) Empty the cup and repeat the rinsing proceedure at least once.
3) Turn the "FUNCTION SELECT" knob to the CONDUCTIVITY position.
4) Select the more concentrated of the two standard solutions and fill the cup within an inch of the lip.
5) Check to see that there are no bubbles inside the Conductivity cell by looking down into the two holes in the rectangular cell-block alongside the dissolved oxygen sensor. A trapped bubble may cause a low reading.
6) If there are bubbles present, flush them out in any manner appropriate. Tapping the cup will usually dislodge a bubble that is trapped in the cell, or a thin wire such as an unfolded paper clip may be employed. Normally an immediate increase in the conductivity reading will be observed when a sizeable air bubble is released from the cell.
7) Install the soft cap and with the Transmitter still in the inverted position, allow the system to equilibrate for a minute, or until there is no longer a change in the conductivity reading.
8) When the reading has stabilized, make any required calibration adjustment according to the instructions given in 5.1).
9) Empty the cup and again rinse twice with distilled water in the same manner as 1) and 2).

10) Using the lower concentration standard, fill the cup within one inch of the lip and repeat steps 5), 6) and 7).

11) Check the meter reading which should be within 1/2% of the value of the conductivity standard used. Do not make further adjustment.

12) This completes the Conductivity System Calibration.

5.4) pH CALIBRATION...Calibrating the pH system requires the use of two pH buffer solutions. Depending upon the application, either pH 4.0 or pH 9.18 is used in addition to pH 7.0. In making any necessary calibration adjustments, there are TWO controls provided for this purpose; the "pH CAL" CONTROL and the "pH SLOPE" CONTROL. Please refer to the TOP BULKHEAD Diagram on the Transmitter Insert.

To calibrate the pH system, proceed as follows:

1) Rinse the sensor assembly twice with distilled water as in 5.3), sections 1) and 2).

2) Using pH 7.0 buffer, fill the Calibration Cup to a level just above the Reference Sensor and allow a minute for equilibration.

3) Turn the "FUNCTION SELECT" knob to the "pH" position and make any necessary adjustment with the "pH CAL" CONTROL as in 5.1).

4) Repeat steps 1) and 2) using either pH 4.0 or pH 9.18 buffer.

5) Allow a minute for equilibration and make any necessary adjustment with the "pH SLOPE" CONTROL.

6) This completes the pH System Calibration.

5.5) OXIDATION-REDUCTION-POTENTIAL (ORP) CALIBRATION...The ORP system is calibrated in so far as any adjustment is concerned. Assuming that the Reference and ORP sensors are not fouled in some way, the Platinum (ORP) electrode develops a potential with respect to the Ag-AgCl (reference) electrode, in accordance with the oxidation-reduction state of the sample in which they are immersed. Once the system is calibrated (at the factory), maintaining calibration becomes a matter of cleaning one or both electrodes. Consequently, there is no calibration ADJUSTMENT provided.

A check on ORP system calibration is accomplished using one or two "Quinhydrone Buffer" solutions. Please refer to section 6.3).

To check the condition of the two electrodes, proceed as follows:

1) Rinse the sensor assembly twice with distilled water as in 5.3).
2) Using either of two prepared "Quinhydrone" solutions, fill the calibration cup to a level just above the Reference and ORP electrodes.
3) Turn the control knob to the "ORP" position and compare the reading on the display with the ORP value of the "Quinhydrone Buffer" in the cup. Since the ORP is slightly dependent on the temperature of the solution, temperature should be measured and taken into account when the ORP value is obtained from the table.

4) Poor comparison between the reading on the display and the ORP value from the table is an indication of a fouled electrode pair.
5) This completes the ORP System Calibration check.

5.6) DEPTH CALIBRATION...the Depth system calibration is merely an adjustment for changes in atmospheric pressure at the site where the measurement is to take place. It is the only system that need be calibrated in the field.

Calibrate or "Zero" the Depth system as follows:

1) At the site where the measurement is to take place, carefully remove the seal-screw identified as "DEPTH ZERO".
2) Remove the storage cup from the transmitter in order to vent the Depth transducer to local atmospheric pressure.
3) Adjust the Depth Zero control in a direction to bring the reading on the display to Zero depth.
4) Replace the seal-screw, paying particular attention to the precautions noted in section 5.1).
5) This completes the Depth System Calibration.

5.7) TEMPERATURE CALIBRATION...The Temperature system is factory calibrated with an NBS traceable thermometer and is accurate to within $\pm$ 0.15^{o}C. No calibration adjustment is provided. A periodic check of the temperature system against a customer owned ASTM thermometer could be helpful in detecting a system malfunction.

5.8) FINAL PREPARATION...The preceding operations conclude the calibration of the Data Transmitter. The following steps *should be taken immediately following calibration:*

1) Turn the system off and disconnect the battery cable and the Data Bus Cable from the Data Control Unit. Peplace all rubber dust caps. Store the battery cable in its case.
2) Remove the Calibration Cup from the Data Transmitter and replace the protective guard on the dissolved *oxygen electrode.*
3) Install the Storage Cup, filled with tapwater, on the Data Transmitter. Tighten just enough to prevent water from leaking during transportation.
4) Check to see that ALL calibration "Seal-Screws" are tightened snugly. DO NOT OVER-TIGHTEN.
5) Disconnect the Data Transmitter from the Data Bus Cable by *pulling straight-away on the two connector* halves. DO NOT TWIST OR BEND the connector in the process. Install the "dummy plugs" on both connector halves to keep them clean during transportation to the field.
6) Remove the "V" shaped support bail from the Transmitter Carrier and while holding the flat circulator motor lead in tension *against the side of the tube, slide the* Data Transmitter down into the tube until it rests against its stop located just above the circulator impeller.
7) Reinstall the support bail by snapping the hook-ends of the bail into the slots provided at the top of the Carrier tube.
8) The System should now be ready to transport to the field.